ELECTRICAL WORLD

A McGRAW-HILL PUBLICATION

OCTOBER 23, 1950 • OUR 76th YEAR

Central Maine's Gas Turbine

New Connector for Pipe-Type Cable

Residential Market Analysis

Electric hay dryers are popular with Virginia farmers

Up-in-the-Air Jobs made Safe

with MURRAY Crows'nest AERIAL LADDERS

A Safe ladder is a steady ladder —

Murray Crows'nest ladders are rigid. They lock tight in position — can't sag forward or backward or sway sideways. Laminated uprights strengthen the ladder appreciably over other types of uprights.

A Safe ladder provides sure footing —

Murray Crows'nest ladders have rungs that are strong and wide — made of hickory for long life. The working platform with its 24 inch long, flat floor has ample space for rock-solid footing.

A Safe ladder provides protection —

Guard rails around the platform protect against slipping. Strong ring bolts are provided for safety belt. Hand rails extending up the ladder are strong and firmly anchored.

Safe? Yes! And much more! Murray Crows'nest Aerial Ladders are versatile. In both height and sweep, the Murray Crows'nest commands every situation it meets because working positions are practically numberless. It's flexible — instantly movable into almost any inclination — and it rotates on a complete circle. It's fast and easy to adjust because each move is semi-automatic.

Do you want Safety — Versatility — Flexibility? The Murray Crows'nest should be your choice.

CAST STEEL TRUSS ANCHOR PLATES
SELF-LEVELING TOOL BOX
PLATFORM IS QUICKLY ADJUSTABLE TO THE INCLINATION
LOADED RAIL FOR PROTECTION AGAINST SLIPPING
RING BOLTS FOR SAFETY BELT
COLLAPSIBLE PLATFORM DROPS INTO PLACE WHEN LADDER IS EXTENDED—FOLDS WHEN LOWERED
WASHER PLATE FOR TIE ROD AND FERRULE BOLTS

The working area is designed for safety.

Write today for free technical Bulletin

Murray MANUFACTURING CORP.

50 Years of Service to the Electrical Industry

1250 ATLANTIC AVENUE • BROOKLYN 16, NEW YORK

Service Entrance & Meter Equipment • Magnetic Circuit Breakers • Switches • Current Limiting Reactors • Crows'nest Aerial Ladders

A FEW CHANGES

Electrical World is 76 years old. We were already eight years old when the first central station on Pearl Street in lower Manhattan began sending electricity to a few thousand light bulbs.

Ever since then we've lived with the electric power industry. Far more than any other publication, we've criticized and applauded, recorded, guided and probed the electric power business.

And today we have ample evidence that the men of this industry turn to **Electrical World** a good deal more than to any other paper, for information to help them do their jobs better.

Having maintained and enhanced our position these many years, you'd think we might be tempted to accept our publishing formula as the **right** one. But a publishing formula is never "right." In our business the essence of leadership is change. And **Electrical World** changes constantly. Soon we're "standardizing" type faces throughout the magazine.

The type now used is Bodoni Book. It looks like this:

cost of building transmission lines

Soon, it will be Times Roman, which looks like this:

cost of building transmission lines

Not much difference, is there? But this and other changes will make **Electrical World** easier to read, and will speed up our make-up and printing. Since we actually have a tighter schedule than most national "news-magazines," this means giving you later news and more assurance of getting your copy on time.

We'll soon have a new design in title, too, and to show you how the new cover will look, here's a picture of the way the News issue looks now, below that is the new design in title:

Yes, **Electrical World** changes constantly. Our biggest job is to watch and guide this transition, to make sure we bring you an **Electrical World** constantly better and more useful.

THE EDITORS

ELECTRICAL WORLD

Published for 76 years for those engaged in the business of generating, transmitting, distributing or applying electric power

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ELECTRICAL WORLD, Published weekly by McGraw-Hill Publishing Company, Inc. Publication Office, 99-129 North Broadway, Albany 1, N. Y. Editorial and Executive Offices, 330 West 42nd St., New York 18, N. Y. James H McGraw (1860-1948), Founder. Curtis W McGraw, President; Willard Chevalier, Executive Vice President; Joseph A Gerardi, Vice President and Treasurer; John J Cooke, Secretary; Paul Montgomery, Senior Vice President, Publications Division; Ralph B Smith, Editorial Director; Nelson Bond, Vice President and Director of Advertising; J E Blackburn, Jr, Vice President and Director of Circulation. Subscription rates: Single copy 35 cents. In the United States, $6 a year, $9 for two years, $12 for three years. Canada, $7 for one year, $11 for two years, $14 for three years. (Canadian money, at par.) Pan-American countries $15 for one years, $25 for two years, $30 for three years. All other countries $20 for one year, $30 for two years, $40 for three years. Entered as second-class matter, November 16, 1936, at the Post Office at Albany, N. Y., under the Act of March 3, 1879. Printed in U. S. A.

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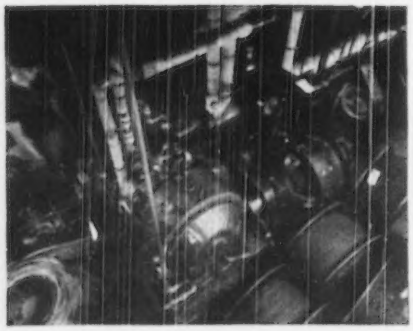
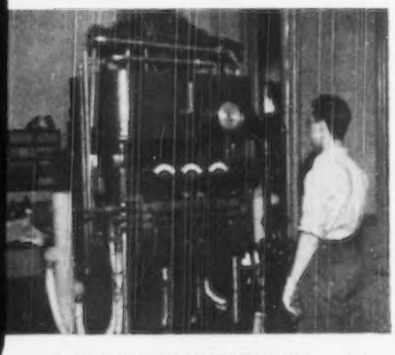
RESEARCH AND TESTING...

EVERY RAW MATERIAL received at Hazard's plant must first pass rigid laboratory tests before release to production.



EVERY STEP IN MANUFACTURE is carefully controlled by sensitive gauges and instruments that assure product uniformity.

EVERY COMPLETED WIRE OR CABLE before shipment must stand up under an electrical pressure test far in excess of what would be expected in normal service.



EVERY PHASE OF CABLE RESEARCH is carried on year in and year out by highly trained and experienced technicians in Hazard's modern research laboratories.

backbone of HAZARD *wire and cable performance*

You're always sure of long, trouble-free, economical service with Hazard wires and cables for two very sound reasons.

First, Hazard research. Year after year, an extensive program of laboratory and field research is carried on to develop ever better cable designs. Close coordination and exchange of information is carried on with the Okonite research program as well. When you select a Hazard wire or cable, you know you're getting the most modern in proved cable design and materials.

Second, Hazard testing. A cable can be no better than the quality of the materials used in its manufacture. Careful, thorough testing of all raw materials is routine. Manufacturing processes are carefully controlled and checked to high standards of uniformity. Finally the finished wire or cable itself is thoroughly tested and must meet rigid standards that protect Hazard's reputation.

This solid foundation on which Hazard quality is built explains why such outstanding records of performance are turned in by Hazard wires and cables in actual service. For example, in all the millions of feet of Hazasheath underground cable that have been installed since it was introduced not a single failure due to inherent defects in the insulation or sheath has been reported. *That's performance.* Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pa.

HAZARD insulated wires and cables for every electrical use

8653

ANCHORAGE for the NEUTRAL SUPPORTED SYSTEM OF SERVICE DROPS . . .

Electroline Automatic Dead End

The 3800 Series Service-Drop Automatic Dead End, for holding pre-assembled service cable that uses a bare neutral conductor as the messenger. This service-drop dead end is assembled as a one-piece unit, with no loose parts to be dropped or lost. It has one end of the flexible bail detachable for installation around a spool type insulator or other supporting anchorage—permitting quick and easy installation. Only one part, other than the conductor, is handled by the lineman. This Electroline Automatic Service-Drop Dead End can be reclaimed and used again. But, once it is installed, it cannot become detached until conductor is removed by the lineman. The practice of gripping the bare neutral employed by the Electroline method of dead ending eliminates the danger of destroying the insulation and short circuiting phase wires.

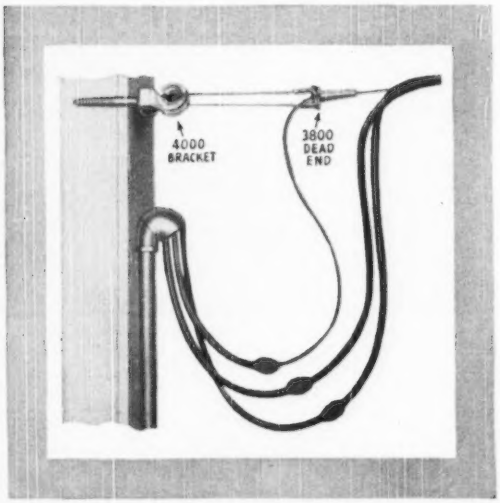
Electroline Anchor Bracket

The 4000 Series Service-Drop Anchor Bracket securely supports the cable at any angle. It is so designed that a closed bail or loop can be easily inserted without opening the loop. This one-piece, light weight unit reduces installation costs and no previous experience is necessary to install it.

The 4000 Bracket eliminates the insulator and insulator hardware at the building.

Two types are available: one with a $\frac{1}{2}$" diameter galvanized lag screw in lengths from 3" to 5" inclusive. The other type contains a $\frac{1}{2}$-13 galvanized nut for use in installations where a threaded end of bolt extends through wall of building.

The Electroline 4000 Series Anchor Bracket is made of aluminum and a galvanized steel lag screw, or nut to withstand corrosion and the discoloration of outside building walls . . . it is vibration-proof and fool-proof.



Both the Electroline Service-Drop Automatic Dead End and Anchor Bracket are designed to harmonize with residential and commercial buildings.

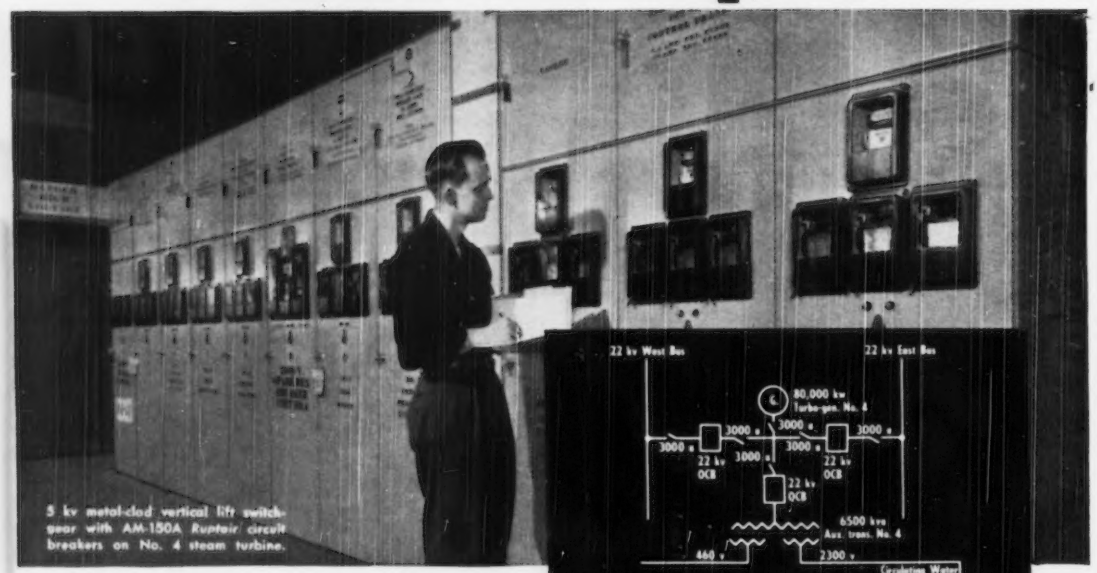
Write for new bulletins for complete details.

Electroline Company

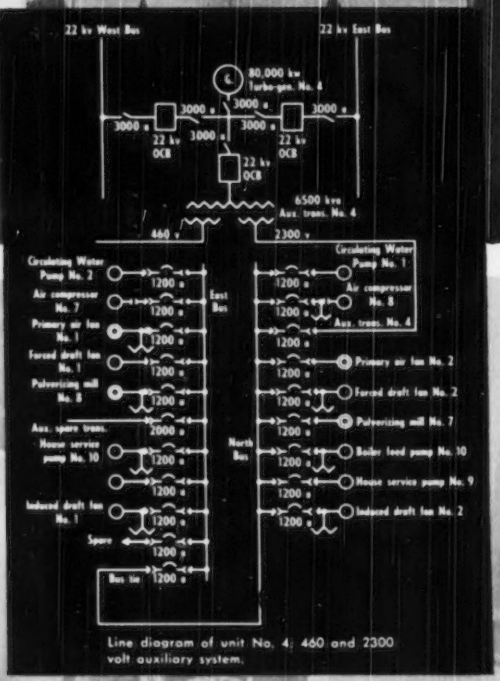
4121 South La Salle Street Chicago 9, Illinois

IN CANADA
POWERLITE DEVICES, LTD., TORONTO

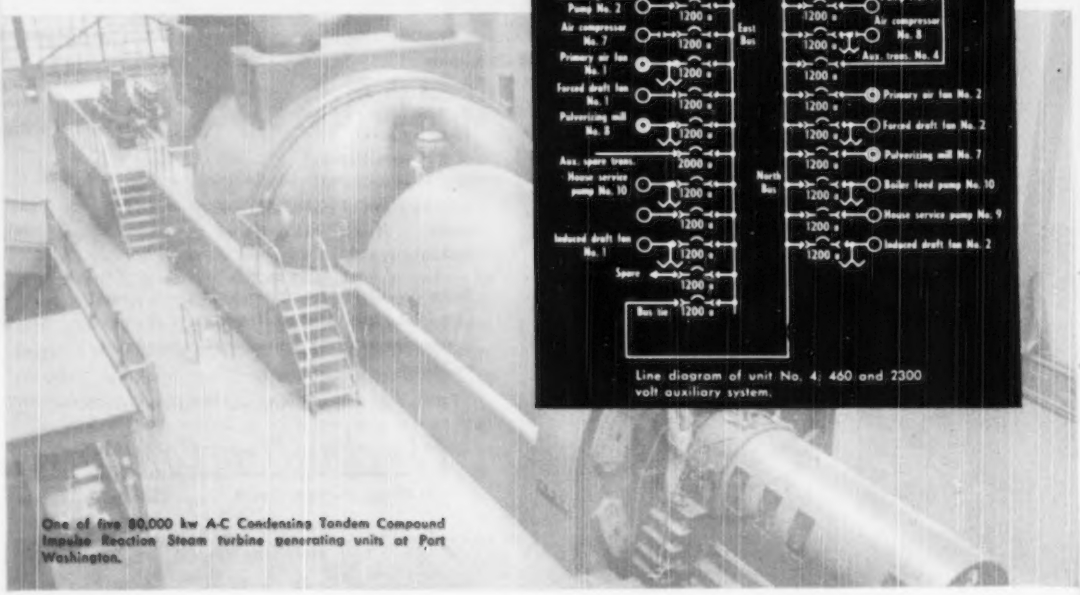
ALLIS-CHALMERS Power Output at



5 kv metal-clad vertical lift switchgear with AM-150A *Runtair* circuit breakers on No. 4 steam turbine.



Line diagram of unit No. 4; 460 and 2300 volt auxiliary system.



One of five 80,000 kw A-C Condensing Tandem Compound Impulse Reaction Steam turbine generating units at Port Washington.

Switchgear Protects Port Washington

Many of today's accepted ideas in steam power production — pulverized coal firing, mill drying, single boiler design, and radiant superheating — were developed by the Wisconsin Electric Power Co. and applied in their efficient Port Washington, Wis., plant.

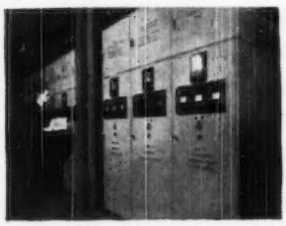
The engineers responsible for design and planning of this plant selected Allis-Chalmers Air Blast and *Ruptair* 5 kv high voltage switchgear to protect valuable auxiliary equipment at their 320,000 kw plant.

TWO DECADES of pioneering in power stand behind the Port Washington steam power plant that serves Milwaukee's metropolitan area . . . and today it is one of the world's most efficient and modern.

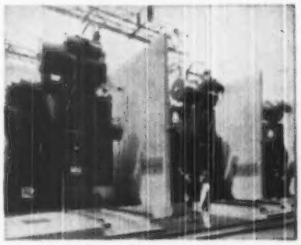
Allis-Chalmers high voltage switchgear protects boiler feed and circulating pumps, induced and forced draft fans, mill motors and air compressors on turbo-generator units number 2 and 4.

Throughout the Port Washington plant you'll find the latest in electrical design. Generated voltage is 22,000 volts. All 22 kv buses and equipment are protected by a fault bus system that instantaneously clears faults before they develop into phase-to-phase short circuits. The bulk of the load is delivered to the 132 kv system through banks of three 30,000 kva single phase transformers. Practically all stationary auxiliary equipment is electrically driven.

Allis-Chalmers switchgear equipment includes 5 kv metal-clad vertical lift switchgear with 600, 1200, and 2000 ampere *Ruptair* breakers on unit #4 and 5 kv metal-clad switchgear with AB 7.5/150 Air Blast circuit breakers on unit #2. FZ-220 oil circuit breakers rated 22 kv protect output on all generators and all step-up transformers. Allis-Chalmers transformers step up 22,000 volts to 132,000 volts transmission line voltage.



On No. 4 unit, East bus, this group of 5 kv metal-clad vertical lift switchgear with *Ruptair* circuit breakers furnishes power protection to electrical equipment.



Three OISC 30,000 kva, 132,000/22000 volt transformers on No. 1 turbine unit.

* * *

It is plain good business to specify Allis-Chalmers switchgear for control and protection of electrical equipment. Standardized, steel-enclosed Allis-Chalmers switchgear can be installed quickly — because it is prefabricated and ready to operate when delivered. Mechanically operated trip-free breakers give low cost reliable operation.

Ruptair circuit breakers incorporate Elkonite faced contacts to insure long life and trouble free repetitive duty. The switchgear is constructed and designed for safety of operation. Sound engineering is reflected throughout each unit.

For more information, call or write your A-C sales office.

ALLIS-CHALMERS, 932A SO. 70 ST. A-2934
MILWAUKEE, WIS.

Ruptair is an Allis-Chalmers trademark

ALLIS-CHALMERS

First In the U. S. with Metal-Clad Switchgear

FOR GREATER SAFETY...

LOWER RESISTANCE...

RUST-PROOF PROTECTION

Only Copperweld Ground Rods Are Stamped "Copperweld"—The Mark Of Permanent Grounding Protection

Copperweld
TRADE MARK

GROUND RODS AND CLAMPS

Over a 25-year period, Copperweld* Ground Rods and Clamps have provided increased safety for persons and equipment and have proved their superiority in service wherever driven ground electrodes are required. These practical features are sound reasons why millions of Copperweld Ground Rods and Clamps are giving permanent grounding protection:

1. **Molten-Welded**—Perfect interlocking weld between the copper and alloy steel eliminates possibility of electrolytic action. No other ground rod has this unique Molten-Welded feature.
2. **Extra Strength**—Rugged core of alloy steel is stronger—tougher—stiffer. Easy driving is assured.
3. **High Conductivity**—Thick sheath of pure copper provides high electrical conductance. Copper-to-copper contacts throughout eliminate high resistance connections.
4. **Non-Corrosive**—Rust-proof, thick copper covering permanently protects alloy steel core against corrosion.
5. **Overall Economy**—Long service life with no maintenance costs. Safe, sure, permanent grounding protection for all types of installations.

Consider these advantages in relation to your own grounding requirements—then plan to standardize on ground rods that are stamped "Copperweld." For Engineering Data, write for Bulletin E.D. 375.

MADE BY
COPPERWELD STEEL COMPANY
GLASSPORT, PA.

* Trade Mark

Copperweld
TRADE MARK
GROUND RODS AND CLAMPS

stocked and sold by { HUBBARD AND COMPANY • JOSLYN MFG. & SUPPLY CO.
And All Their Distributors

WE TREAT 'EM ROUGH, TO MAKE 'EM BETTER!

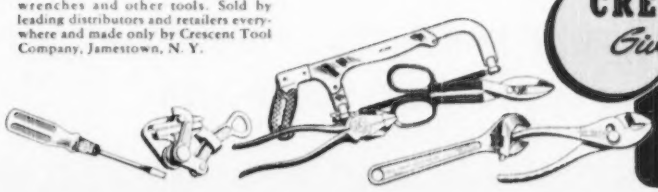
● Very few tools take the abuse that the average screwdriver absorbs. Because of this, Crescent Screwdrivers are subjected to stringent tests before they leave the factory. The Torsion Test illustrated shows how we "Treat 'em Rough, to Make 'em Better." Individual "Temper Tests" also check the full-length hardening of the blade.

Crescent Screwdrivers are made to strict specifications. That's why experienced industrial buyers prefer them. They find too that Crescent's better manufacturing procedure shows up in terms of greater safety for the worker. There is a Crescent for every class of work . . . blade lengths from 1½ to 12½ inches. Be Safe . . . standardize on these fully-guaranteed Crescent Tools.

The Torsion Test to which every Crescent screwdriver blade is subjected before assembly

CRESCENT TOOL COMPANY, JAMESTOWN, N. Y.

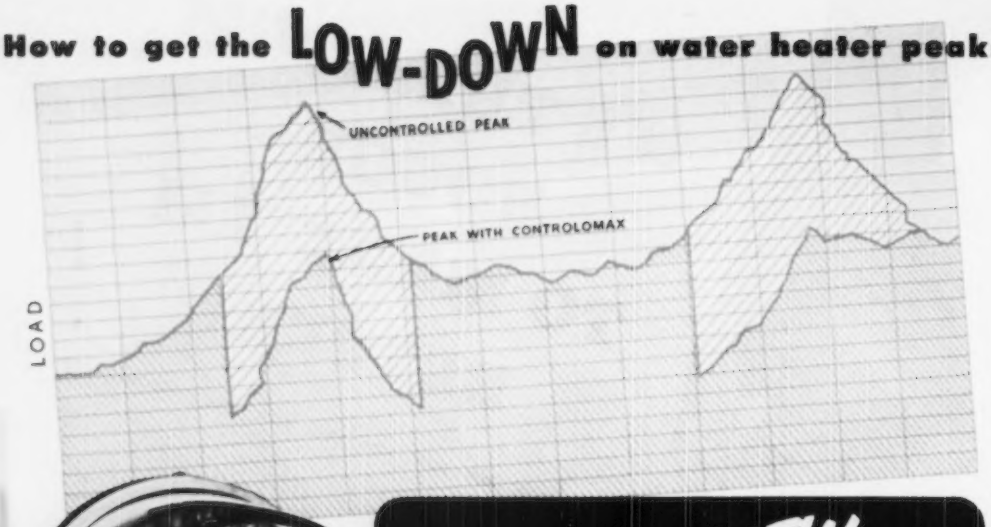
"Crescent" is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by Crescent Tool Company, Jamestown, N. Y.

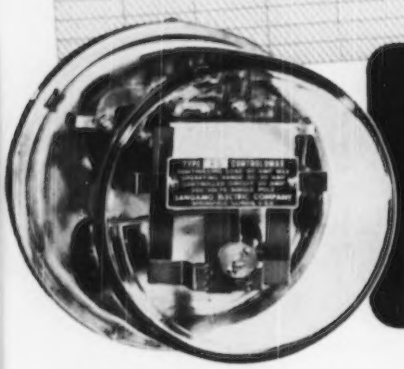


CRESCENT TOOLS
Give Wings to Work

Sign of the Artisan
Symbol of Excellence

How to get the LOW-DOWN on water heater peaks





with the NEW SANGAMO CONTROLOMAX

Type AS (Socket) Enclosure

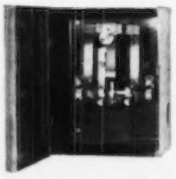
To assure profitable returns from water heater loads, the effect of their demands must not result in costly peaks, as is the case when electric ranges, ironers, clothes dryers or other large current consuming devices are used at the same time water is being heated.

Now, an exceptionally simple control device, the new Sangamo Controlomax, will prevent water heater demands from adding to these peaks. When load currents reach pre-determined levels the water heaters are disconnected. As soon as the load current is reduced to an established level, the water heater is re-connected. Thus, on the basis of consumers' load and use habits, peaks are reduced and long charging periods and low demands will result.

The Sangamo Controlomax is an automatic thermal switch. A bimetallic strip with a slow, positive motion operates a contact. Maintenance will be practically nil. Time settings are unnecessary. The first cost is low, and operating costs are at a minimum.

Now, Sangamo adds to its complete line of time switches and meter-time switch combinations for *time* control of water heater peaks, a simple thermal control based on the *magnitude of the consumer's load*.

Write for bulletins on the complete line of controls for electric water heater loads.



Type AB (Box) Enclosure

SANGAMO ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

"Piping by Midwest" means the very best in piping at lower completed cost. Being accurate in dimension and alignment, Midwest subassemblies are easy to erect . . . difficult operations are performed in our fabricating plants and field work is simplified. When desired, Midwest will also erect the piping with undivided responsibility. You will find it to your advantage to call on Midwest whenever you need piping.

MIDWEST PIPING SERVICE IS NATION-WIDE

MIDWEST PIPING & SUPPLY CO., Inc.

Main Office: 1450 South Second St., St. Louis 4, Mo.

Plants: St. Louis, Passaic, Los Angeles and Boston

Sales Offices: New York 7—30 Church St. • Chicago 3—79 W. Monroe St.
Los Angeles 33—520 Anderson St. • Houston 2—1213 Capitol Ave.
Tulsa 3—224 Wright Bldg. • Boston 27—426 First St.

PIPING FABRICATORS AND CONTRACTORS

4 Plants Are Better Than 1

4194

YOU ASKED FOR IT!

HERE IT IS!

AN ECONOMICAL-VERSATILE CABLE TROUGH!

COPE introduces its newly-designed Cable Trough System with its greater versatility—its easier installation—its rounded, streamlined fittings—all of which mean more savings to customers.

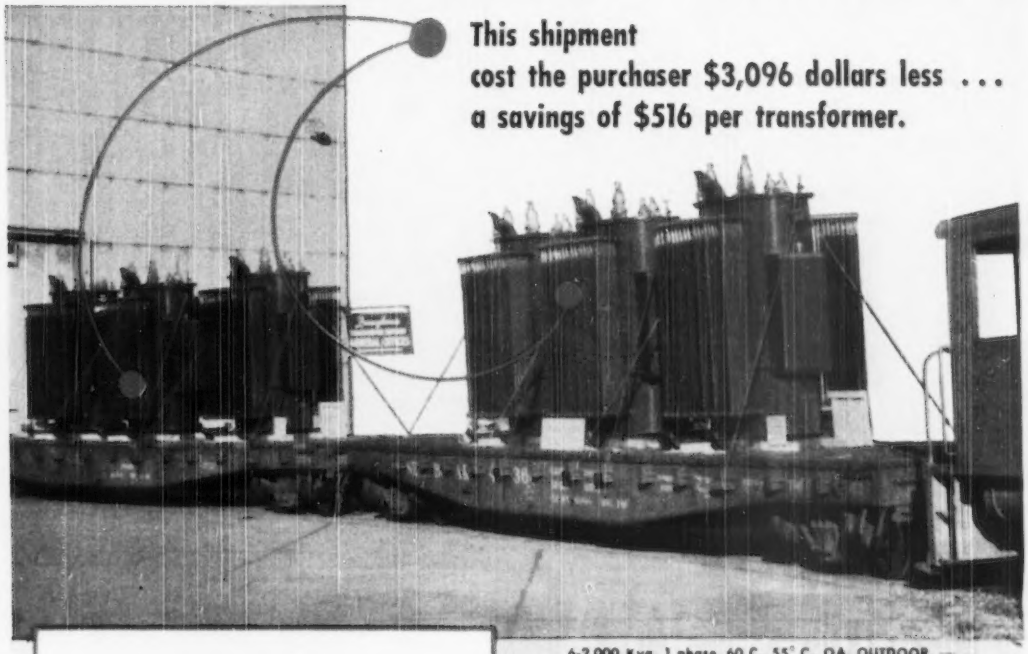
Ever since COPE originated Cable Trough of flattened expanded metal, Design Engineers in ever-increasing numbers have been specifying it. To be able to purchase a standard system of trough that can be assembled more easily than a pipe installation—with turns, branches, reductions, vertical as well as horizontal runs—has naturally made COPE Trough a *must*. Small wonder the COPE Method is a *real time saver*—yes, a *real money saver* in design and installation costs!

Throughout the country industrial plants as well as utilities are using COPE Trough to support power and control cables and instrument tubing. Let COPE solve *your* Trough problem! Write today for Bulletin 63A, which fully describes COPE'S latest design.

T. J. COPE, INC., 711 SOUTH 50th STREET
PHILADELPHIA 43, PENNSYLVANIA

T.J. Cope INC.

You pay LESS for Pennsylvania Standard Parts Power Transformers



This shipment cost the purchaser $3,096 dollars less . . . a savings of $516 per transformer.

6-2,000 Kva, 1 phase, 60 C., 55° C., OA, OUTDOOR, — H. V. : 13,800 Volts.
Full capacity taps for 14,400, 14,100, 13,300, and 13,200 volts. — L. V. : 2400/4160Y Volts.
Inert gas — oil seal.

WHY

Standard Parts Power Transformers Can Be Sold For Less

Standard Parts Power Transformers can be purchased at worthwhile savings because of quantity production of standard parts produced with adequate tools and equipment. This has improved the quality of the workmanship, reduced the possibility of errors, and permitted more rigid inspection during the various stages of production. These factors, together with reduced production time, have shown a cost saving which has been passed on to the user.

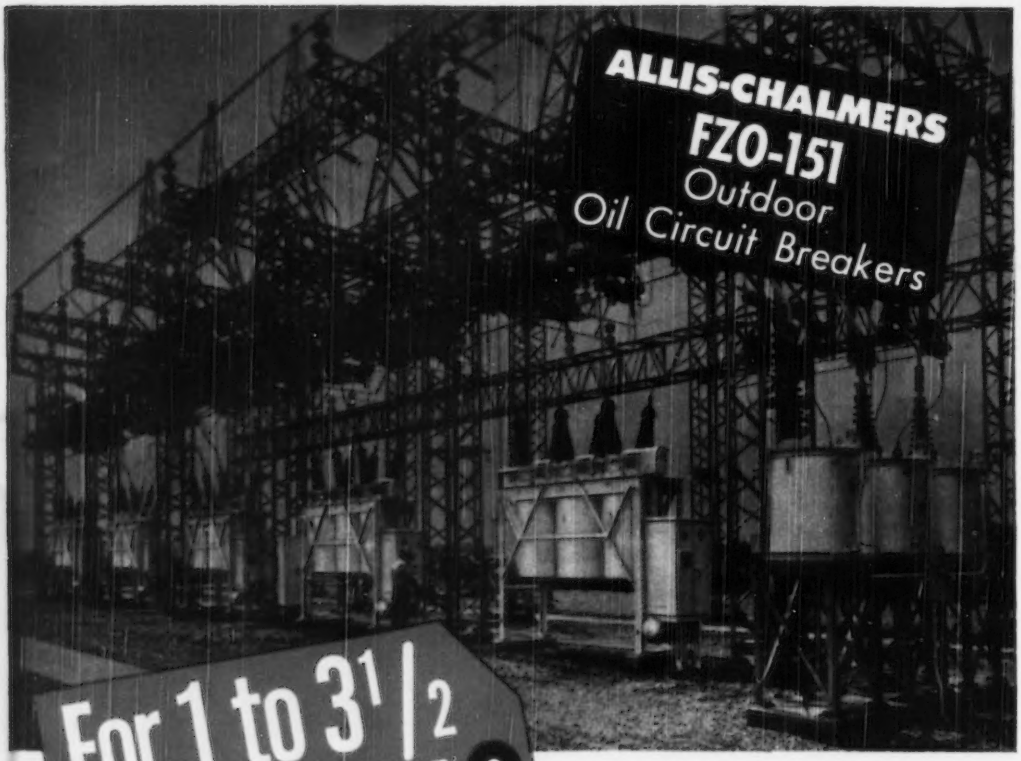
A considerable amount of money was saved in the purchase of these transformers because the purchaser's requirements — mechanical and electrical — fitted into Pennsylvania's Standard Parts Power Transformer program.

Standard Parts Power Transformers are single phase transformers in sizes up to 5,000 Kva, 69 Kv; and three phase transformers in sizes up to 10,000 Kva, 69 Kv, which have standard or optional voltage ratings and standard or optional accessories. The type of oil preservation method familiar to the purchaser's operating personnel is supplied on these transformers — gas-oil seal, sealed tank, inert gas pressure, or expansion tank system.

Pennsylvania TRANSFORMERS

Pennsylvania TRANSFORMER COMPANY

Canonsburg, Pennsylvania — Greater Pittsburgh District



- MECHANICALLY TRIP-FREE PNEUMATIC OPERATOR *assures positive tripping*
- SINGLE-BREAK *RUPTOR* DEVICE *(5 cycle interruption if required) for low arc energy release*
- EVERY BREAKER *factory assembled, tested, and shipped without dismantling.*

INSTANT, POSITIVE CONTACT OPENING under all conditions is *assured* with FZO-151 breakers. The reason is Allis-Chalmers mechanically trip-free pneumatic operator. In case of a fault, the operator is effectively uncoupled from contact mechanism by means of a positive mechanical linkage. Contacts open *independent of valve operation or cylinder back pressures . . .* there's nothing to hinder instant tripping.

Positive operation is further assured with simple, single-break *Ruptor* interrupting device that extinguishes arc without use of unnecessary moving parts that may bind or fail. Self-cleaning action of bayonet-type moving contacts prevents formation of high resistance oxides. Low inertia pole unit mechanism of straight line motion type gives high speed interruption with low arc energy release.

Complete factory test data accompanies every breaker. For details on Allis-Chalmers breakers for any utility need, contact your A-C sales office,

ALLIS-CHALMERS, 932A SO. 70 ST. MILWAUKEE, WIS.

STANDARD RATINGS
(8 cycle interruption)

Rated KV	Rated amp. 60 cycle	KVA Interrupting Capacity
69	600	1,000,000
69	1200	1,500,000
69	1200	2,500,000
69	2000	3,500,000

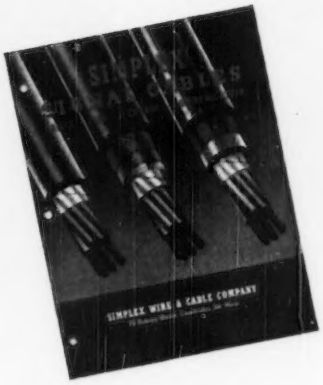
GET NEW BULLETIN
71B7045 for ratings, dimensions and details of construction of type FZO-151 breakers.

A-3073

Ruptor is an Allis-Chalmers trademark

ALLIS-CHALMERS

for
Low-Cost, Trouble-Free Operation of Signal Control and Communications *circuits..*



CATALOG 1010
gives detailed information and specification data. Write us today for your copy.

SIMPLEX
POLYETHYLENE-PLASTEX
SIGNAL CABLES

- Light in Weight
- Small in Diameter
- Have Low Capacitance and Attenuation

THEIR POLYETHYLENE INSULATION ...

- Is Thin-wall; permits more conductors per cable for a given diameter, more circuits per conduit
- Has High Dielectric Strength and High Insulation Resistance
- Has Low Dielectric Constant and Low Power Factor
- Resists Water and Moisture, Oils, Chemicals, Sunlight and Aging
- Features Low Cracking and Shattering Temperatures

THEIR PLASTEX JACKET ...

- Is Tough yet Flexible
- Remains Stable Over a Temperature Range of about 200 F.
- Resists Cracking down to —58 F.
- Provides Protection against Abrasion, Oils, Chemicals, Flame, Sunlight and Aging
- Is available in three types to meet all conditions of Aerial, Conduit, and Underground Service

Simplex
WIRES & CABLES

SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

Above: Linemen tie in the newest Westinghouse "CSP" Transformer to go on the Ohio Edison system. It's the 1,000,001st "CSP" Distribution Transformer to come off the Westinghouse production line.

Inset: The first Westinghouse "CSP" Transformer, installed by Ohio Edison in November, 1933. On Route 8 North of Akron, Ohio, it's still giving dependable service today.

YOU CAN BE **SURE**.. IF IT'S

Westinghouse

SEVENTEEN YEARS

Proof enough for one customer

Back in 1933, Westinghouse delivered the first of a new type of distribution transformer to Ohio Edison . . . the "CSP" (Completely Self-Protecting) Transformer. Today, seventeen years later, it's still in service. For a "CSP" Transformer, this record is not unusual.

Ohio Edison has standardized on the completely self-protecting type of transformer and in line with this policy, Westinghouse "CSP" number 1,000,001 has been installed on the Ohio Edison System.

Such performance establishes beyond doubt that "CSP" Transformers offer long-range dependability plus savings in operating costs. It's easy for you to prove for yourself that "CSP" Transformers, with both thermal and lightning protection built in, can cut distribution costs for you . . . are economical to install . . . inexpensive to maintain. Ask your Westinghouse representative for a copy of B-4247B, "TRANSFORMER COSTS . . . and their relation to PROFITS". Or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70567

Westinghouse

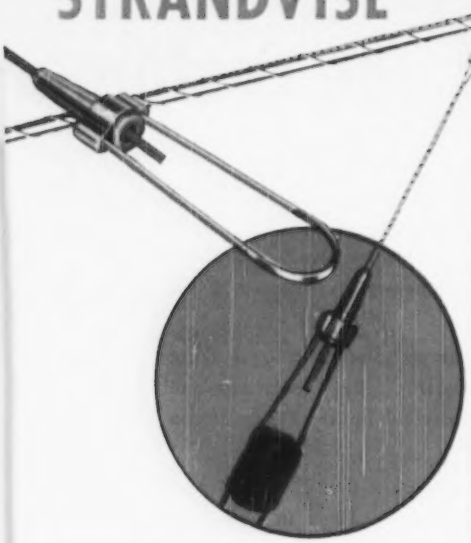
"CSP" TRANSFORMERS

SINGLE PHASE THREE PHASE BANKED SECONDARY

NOW YOU CAN SPLICE OR DEADEND STEEL STRAND IN SECONDS

TWO NEW Reliable CONSTRUCTION SPECIALTIES

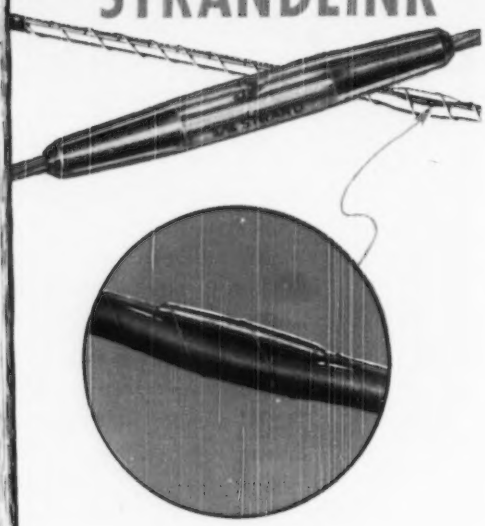
STRANDVISE



Reliable's two great new construction specialties, STRANDVISE and STRANDLINK, will cut installation time by 90% — save you money in many ways — simplify one of your major operations. STRANDLINK splices messenger wire in seconds, eliminating removal of the lashing machine as with old fashioned nuts, bolts, hardware and johnny balls.

In STRANDVISE and STRANDLINK, Reliable takes the industry's first significant step toward greater installation and relocation economy in a half-century. Investigate these new, modern units yourself. Send for free samples *today*.

STRANDLINK



Jaws on Reliable's new STRANDVISE and STRANDLINK grip surely, will not slip. Hundreds of case-hardened Zinolite-plated steel teeth do the gripping — grip sharply, yet without gashing. Heat treated aluminum cartridges, alloy yokes, and stainless steel bails have strength factors far beyond that of the strand. Assembly is factory treated with corrosion-resistant lubricant. No installing tools needed.

POWER LINE CONNECTORS AND CONSTRUCTION SPECIALTIES

Reliable ELECTRIC COMPANY

3145 CARROLL AVENUE, CHICAGO 12, ILLINOIS

OVER 40 YEARS OF SERVICE TO THE UTILITIES

Westinghouse uses BERYLLIUM COPPER

An outstanding design feature of the Westinghouse "V" type disconnecting switch is the simple, one-piece break jaw made of BERYLCO 10. This air break switch was developed for outdoor operation at 7½ to 230 KV, 400 to 4000 amperes. Depending upon the current, the beryllium copper jaw is either formed from BERYLCO 10 strip or cast from BERYLCO 10C ingot.

Because of its unique combination of good electrical conductivity and high elastic properties, BERYLCO 10 permits one-piece jaw construction, giving simplicity and efficiency of operation. The jaw must grip the moving contact tightly under all conditions over a wide current range and withstand excessive deflection under repeated operations without permanent set.

Only high-conductivity beryllium copper, of all current-carrying materials, possesses the spring properties required to meet the exacting demands of this Westinghouse switch part.

Available as
ROD AND BAR
Rounds, rectangles, hexagons and squares. Write for Bulletin 13 for available forms and sizes.
WIRE
Heat-treatable and pre-tempered. Detailed information furnished on request.
STRIP
Send for Bulletin 12 for full particulars on cold-rolled, slit edge strip.
CASTING ALLOYS
Supplied as casting ingot.

HELPFUL ENGINEERING INFORMATION

contained in a new series of Beryllium Copper Technical Bulletins. If you wish to receive these regularly, write us a note on your company letterhead.

BERYLCO BERYLLIUM ALLOYS

THE BERYLLIUM CORPORATION

DEPT. 11, READING 9, PA.

Offices in New York, Springfield (Mass.), Cleveland, Dayton, Detroit, Chicago, Minneapolis, Seattle, San Francisco, Los Angeles • Representation in principal foreign countries

Rough going for

But U·S·S Amerclad does the job,

TYPES OF
U·S·S American Cords and Cables

PORTABLE CORDS

For heavy duty electrical tools such as drills, hammers, grinders, reamers, saws, pumps, etc.
Oil-Proof Neoprene Cords
Miners Lamp Cord
Shot Fire Cord

PORTABLE POWER CABLES

Type SM-D Three Conductor
Shielded Type G Three Conductor with ground wires.
Type W Three Conductor
Type W Four Conductor

MINING CABLES

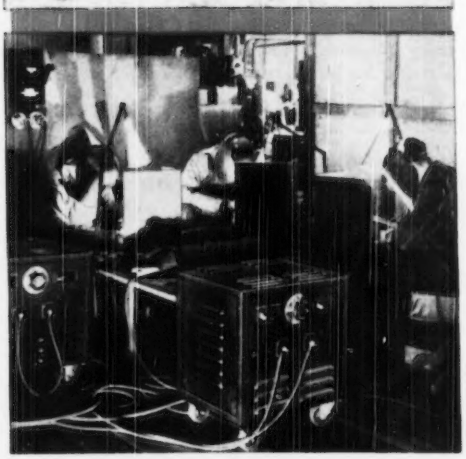
Locomotive gathering cables—single conductor mining machine cables:
Two conductor, Round
Two conductor, Concentric
Two conductor, Twin Parallel
Two conductor, Twin Parallel with ground wire

MISCELLANEOUS

Railway Utility Cables
Motor Lead Cables
Welding Cables
Grounding Cables
Traveling Cables

these cables

on the ground or in the ground



● It's hard to imagine operating conditions that are tougher than those shown on these pages.

The coal cutter, for instance: This machine has a take-up reel that constantly coils and uncoils the cable. The strong Amerclad Cable must withstand continual flexing, and it must resist acid waters and high temperatures. Additional proof of superiority is the fact that Amerclad Cables easily pass the State of Pennsylvania flame test for mining cables.

You'll find Amerclad Cables widely used for electric power shovels and other equipment that must operate out in the open. Sunshine won't crack the specially compounded "tire-tread" rubber that can be dragged over sharp rock and rough floors without damage.

For the high voltages, Amerclad Cables are supplied with a conducting rubber tape known as PS Shielding. This eliminates one big disadvantage of metallic shielding—which, when kinked, often separates from the insulation and causes corona discharge. PS Shielding is a development of the American Steel & Wire Company engineers. It has proved so successful that other electrical wire companies have been licensed to use this construction.

You can bury Amerclad Cables deep in the ground, without any protection. Water can't penetrate the live rubber cover. And you eliminate expensive conduit or overhead pole systems.

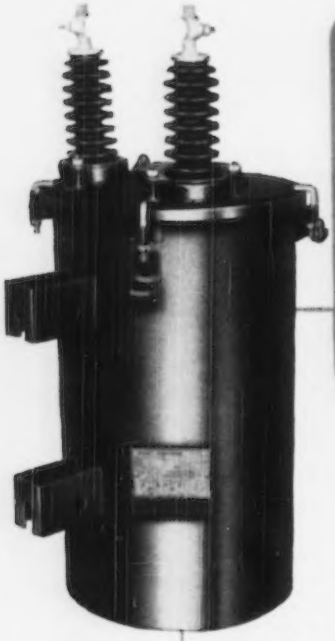
There is an Amerclad Cable for every need—cords for portable machinery and tools, cables for mining machinery, trolley buses, dredges, welders, machine tools, etc. And—this is important—our complete range of rubber compounds can be *combined* in cable construction to fit the requirements of every industrial, mining and submarine installation.

AMERICAN STEEL & WIRE COMPANY, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA STEEL COMPANY, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM, SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

AMERCLAD CABLES

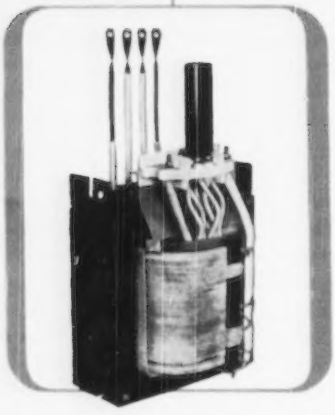
UNITED STATES STEEL



WAGNER

Form W

TRANSFORMERS



The Form W core is made of cold rolled oriented grain transformer steel, carefully annealed to obtain the lowest practical magnetic losses. The preformed core is assembled in rectangular shape to provide a path for the magnetic flux parallel to the grain of the steel.

What Does Form W Mean?

Form W is the general type designation of our new line of distribution transformers with cores of cold rolled oriented grain steel. The Form W Distribution Transformer is built to pay dividends in extra service because it's built the Wagner way—the design had to be proved before it was put into production . . . every piece of material and every construction and assembly step had to be carefully controlled, checked, inspected and tested to rigid Wagner specifications.

Small Size—Light Weight

The Form W design results in considerable reduction in the size and weight of all ratings. Form W Transformers require less oil and are compact and easy to transport, store and handle—exactly *right* for modern distribution systems. But Form W Transformers are liberally designed, and no compromises are made merely for the sake of a few inches or a few pounds.

Excellent Electrical Performance

Core and copper losses are relatively low; regulation at both 100% and 80% PF are good; and exciting current is extremely low. When you add high short time overload capacity, you have a transformer that gives the type of service you need.

* * *

Wagner Form W Distribution Transformers are available in ratings through 15 KVA, 15,000 volts and below.

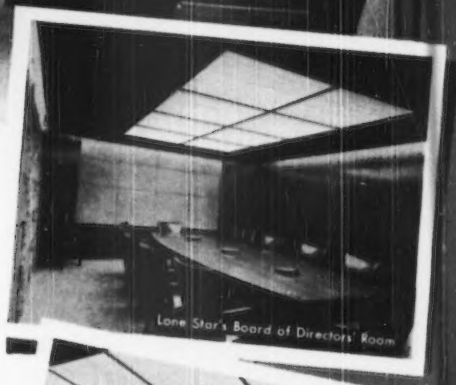
Why not investigate the Form W today? Just call your nearest Wagner branch, or write us.

WAGNER ELECTRIC CORPORATION
6456 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

BRANCHES IN 31 PRINCIPAL CITIES

In Lone Star's Reception Room
ten 33½" x 41" panels of white translucent PLEXIGLAS are mounted 12" below twenty 30-watt 36" fluorescent lamps, spaced on 16" centers. Average illumination 55 foot candles. Design and installation by The Frink Corp., Long Island City, N. Y. Architects: Kenneth H. Ripnen Inc., New York City. Lighting Consultant: E. B. Silverman, Smith & Silverman, New York City.


Lone Star's Board of Directors' Room

Lone Star's Executive Offices

Skylighted Office? No! It's a PLEXIGLAS Luminous Fixture

Man-made daylight—soft, even, glare-free—is a functional and decorative feature of Lone Star Cement Company's new offices in New York City. In nearly every room, PLEXIGLAS Luminous Ceilings diffuse light so perfectly that a *luminous environment* is created, easy on the eyes and nerves.

PLEXIGLAS simplifies the design, installation and maintenance of other lighting fixtures, too. Because this acrylic plastic is easily cut, shaped and fabricated, it adapts readily to coffer, cove or trough lighting, completely enclosed units, wall or overhead lighting of all kinds. Lightness and strength make it easy and inexpensive to ship and erect. Resistance to breakage and discoloration cuts maintenance costs to a minimum.

Get Full Details Today. Free information on PLEXIGLAS Quality Lighting for offices, homes, stores, drafting rooms, public buildings, is yours for the asking. Send for our new brochure, No. 77, "As Light as Day the PLEXIGLAS Way," and tell us about your lighting problem. The counsel of our Design and Fabrication Laboratory Staff is yours without obligation.

PLEXIGLAS *is a trade-mark, Reg. U. S. Pat. Off., and in principal foreign countries.*
Canadian Distributor: Crystal Glass & Plastics, Ltd., 54 Duke Street, Toronto, Ontario, Canada

CHEM[illegible] FOR INDUSTRY

ROHM & HAAS COMPANY
WASHINGTON SQUARE, PHILADELPHIA 5, PA.
Representatives in principal foreign countries

Milestones of engineering

The modern Foster Wheeler Steam Generator, heart of many of the most efficient central station and industrial power plants in America and elsewhere, reflects the engineering and production ingenuity of an organization long recognized as a pioneer and innovator in the field of steam generation.

The story of Foster Wheeler achievement is best revealed by the following milestones of engineering progress:

1898—**Aero pulverizers** firing various fuels applied successfully on a commercial scale.

1902—**Superheated steam introduced** commercially in the United States.

1904—**Convection superheaters** standardized with cast iron, extended surface rings applied to steel tubes. Bare tubes later used with improved design technique and improved metal selection.

1912—**Air preheaters** of tubular type built and operated. Plate type heaters followed a few years later.

1917—**Water tube boilers** designed for production on a large scale—both oil and coal fired.

1919—**Economizers** of high pressure, extended surface, unit type introduced.

1919—**Radiant superheaters** developed after long research and experimentation.

FW

EXPERIENCE...the priceless

progress

1924—Water walls and water backs applied to many types of furnaces burning various fuels.

1934—Pulverized anthracite burned in direct-fired system eliminating need for pulverized fuel storage.

1935—Radiant reheaters and radiant superheaters installed in one of the first large high pressure reheat units in the country.

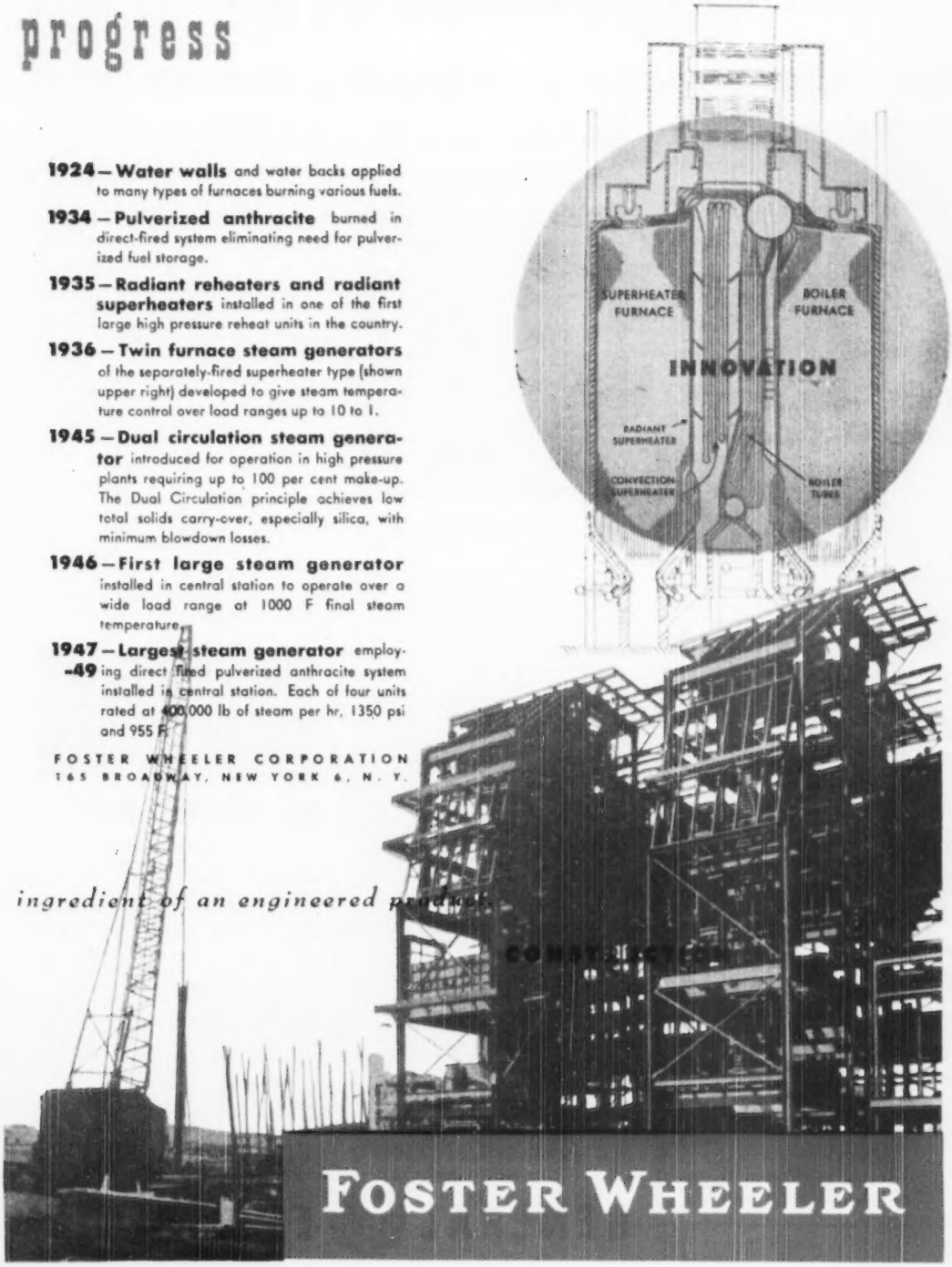
1936—Twin furnace steam generators of the separately-fired superheater type (shown upper right) developed to give steam temperature control over load ranges up to 10 to 1.

1945—Dual circulation steam generator introduced for operation in high pressure plants requiring up to 100 per cent make-up. The Dual Circulation principle achieves low total solids carry-over, especially silica, with minimum blowdown losses.

1946—First large steam generator installed in central station to operate over a wide load range at 1000 F final steam temperature.

1947-49—Largest steam generator employing direct fired pulverized anthracite system installed in central station. Each of four units rated at 400,000 lb of steam per hr, 1350 psi and 955 F.

FOSTER WHEELER CORPORATION
165 BROADWAY, NEW YORK 6, N. Y.



ingredient of an engineered product

FOSTER WHEELER

WIRING NEWS

A PERIODICAL DIGEST OF WIRING IDEAS FROM THE GENERAL ELECTRIC CONSTRUCTION MATERIALS DEPARTMENT

Master Selector Switch Adds New Remote Control Uses

Have you stopped to consider the amazing versatility added to General Electric's remote-control wiring system by the master selector switch?

Replacing gangs of separate ON and OFF controls, the compact master selector switch, RMS-1, provides instant, positive control of up to nine different circuits.

You'll do well to use it as an added talking point in arousing *even more interest* in remote control. Point out how one or more master selector switches can provide advantages such as these:

In Homes and Apartments

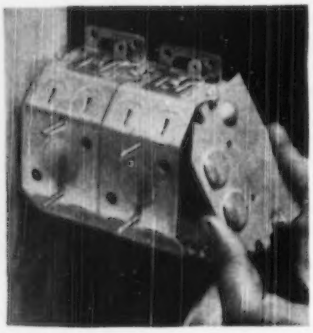
Instant bedside control of all interior and exterior lighting in case of emergencies. Added convenience through control of kitchen appliance outlets and attic ventilators from several different points. Control of key indoor and outdoor lights from the garage, front door, back door, and bedroom.

In Plants and Factories

Control of fire and alarm circuits. Control of watchman's circuits and provision for pathway lighting on his rounds. Selective control of aisle lights, individual work area lights, outlets, and small electrically-operated machinery from any desired point.

Then too, there are many applications for farms, swimming pools, parking lots, athletic fields, tourist cabins, schools, museums, hospitals—and you can probably think of many more. For further information simply check box (A) below.

New Levelock Switch Box Can Take Punishment



Neither hammer blows nor construction-site abuse can dislodge the side plates of the new General Electric Levelock switch box. Wedging action of a new locking mechanism locks box parts securely in place—yet is simple enough to permit fast, certain assembly of switch-gangs.

Leveling the box against the studding is also a faster, easier operation. Four contact points—instead of the usual three—prevent tilting or rocking of box during nailing.

In addition to nail-through holes, an extra set of nail holes through the side plates allows speedy gang mounting of the Levelock box direct to studding. Extra side-plate pryouts provide for out-of-the-ordinary installations. All pryouts are easily removed by a quick twist of a screwdriver.

A new single-screw ear adjusts from slightly above to $\frac{5}{8}$-inch below the edge of the new Levelock box, while an extra-sturdy bridge across the ear adds increased strength. There's plenty of space, too, within the bridge to accommodate the device strap.

The ingenious construction of General Electric's Levelock saves time when used on either new construction or modernization work. Builders and contractors will appreciate your telling them about the Levelock box, so check box (B) in the coupon for complete information.

New Geotrol Wire Defies Gasoline and Oil Hazards

Heavy, lead-sheathed cable is no longer necessary for underground wiring in conduit to gasoline pumps and floodlights at filling stations. General Electric Geotrol (Type TW) wire—resistant to petroleum products—offers new ease of installation at a lower cost.

Refineries and other industrial plants, where lighting and control circuits are exposed to oil or gasoline, can also use Geotrol wire to advantage.

Insulated with time-proved Flamenol*, Geotrol wire has an additional protective jacket that is highly resistant to gasoline, oil, and other hydrocarbons. Specifically developed for installations where gasoline and gasoline vapors are likely to occur, Geotrol wire is listed by Underwriters' Laboratories, Inc. for operation at 30 C under such conditions.

G-E Geotrol wire is lightweight, is easy to pull through conduit, and is manufactured in seven bright colors. Awg sizes 14, 12, and 10 are available. For information, check box (C) in the coupon.

* Registered Trade Mark of General Electric Co.

New Hung Ceiling Box*

For fast, easy installation and real savings on jobs using conduit, this new hung ceiling box is hard to beat. Virtually eliminating special couplings and pipe bending operatings, this easy-to-handle, eight-sided ceiling box allows conduit to enter the knockout—over the grid structure—from all eight angles. In addition, the lower row of knockouts permits conduit runs parallel to channels.

Four-point suspension of the box is provided by two sturdy mounting bars. With bars in a parallel position, the box slides back and forth for quick, easy centering. When spread slightly, the box locks securely into any desired position for easy wiring.

For long life and utmost protection against corrosion, the new hung ceiling box has been hot-dipped galvanized. For full particulars check box (D) in the coupon.

(*U. S. Patent No. 1,954,481)

Section K-12-1027

Construction Materials Department, General Electric Company, Bridgeport 2, Connecticut

- ☐ A—Remote-control Master Switch
- ☐ B—Levelock Switch Box
- ☐ C—Geotrol Type TW Wire
- ☐ D—Hung Ceiling Box

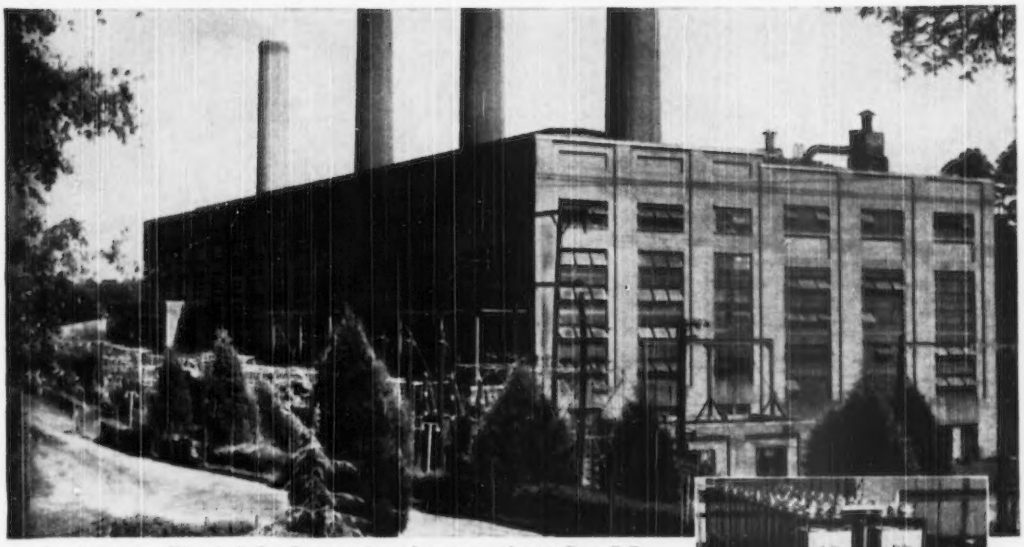
Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

GENERAL ELECTRIC



South Carolina Electric & Gas Company's modern steam plant at Parr, S.C.

At this modern station...

Exide-Manchex Batteries

At the Parr, S. C. plant of the South Carolina Electric & Gas Company, positive switchgear operation is assured by the use of Exide-Manchex Batteries. They are used to operate the 132,000-volt, 600-ampere circuit breakers and to take on an intermittent load of 25 to 40 amperes required for slag removal equipment.

You can always count on Exide-Manchex for proved dependability, long life and low cost maintenance. Important among its many features are:

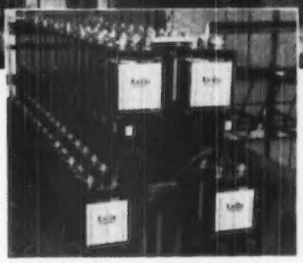
- the famous manchester positive plate with its *exclusive* lead button construction.
- slotted plastic separators, impervious to chemical and electrical reaction.
- plastic spacers that maintain plate alignment.
- the latest development in molded glass jars.
- heavy terminal posts with copper inserts for extra conductivity.

Use the Exide-Manchex for all your stationary battery applications in central and sub-station service.

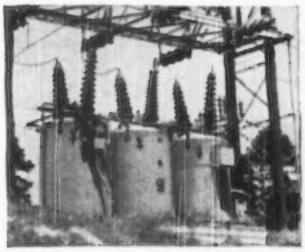
THE ELECTRIC STORAGE BATTERY CO., Philadelphia 32
Exide Batteries of Canada, Limited, Toronto

"Exide" and "Manchex" *Reg. Trade-marks U. S. Pat. Off.*

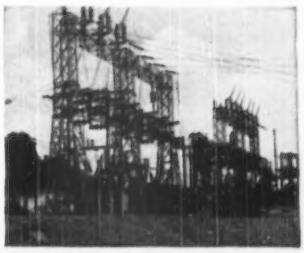
1888... DEPENDABLE BATTERIES FOR 62 YEARS... 1950



60-cell Exide-Manchex switchgear control battery, EME-13, mounted on two, 2-step racks.



132,000-volt, 600-ampere oil circuit breaker, operated by Exide-Manchex Batteries.



A part of the 114 K.V. Switchyard showing three bays of high voltage switchgear.

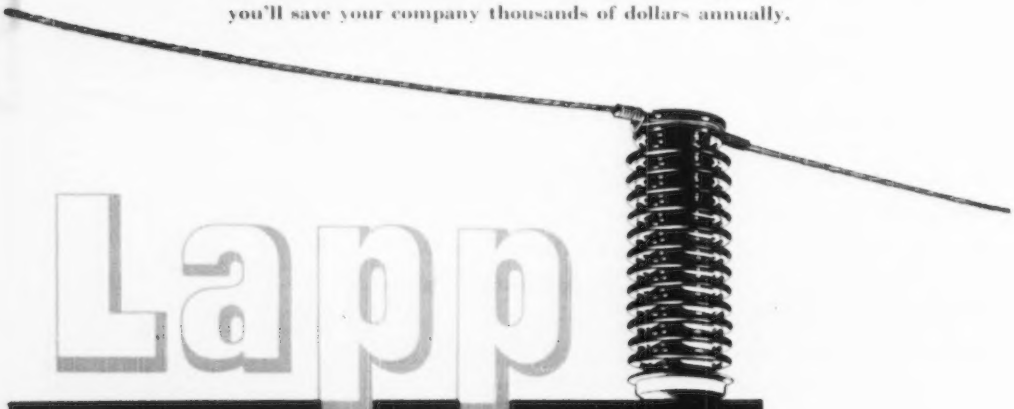
Remember this Ad

Next time you get a bad lightning storm...

Maybe you think your company has "no trouble" with transmission insulators... How many pin-type insulators do you suppose had to be replaced as the result of your last bad lightning storm? Just "normal" replacement, you may think; "Every piece of equipment calls for a certain amount of maintenance, and insulator costs are low."

We strongly urge you to take a critical and detailed look at those "normal" transmission insulator maintenance costs. We predict that you'll find it a whale of a lot bigger expense item than you suspect. What's our reason for wanting you to know just what that cost item is?

...why, we've got an insulator with a proved record of ability to cut that expense to a tiny fraction of what it now is. The Lapp Line Post. We think that if you'll make a fair comparison of maintenance costs, you'll standardize on Lapp Line Posts for all transmission duty up through 69Kv. And you'll save your company thousands of dollars annually.



Lapp

LAPP INSULATOR COMPANY INC., LEROY, NEW YORK

knowledge plus experience

. . . these have given him the surest instrument

. . . faith in himself

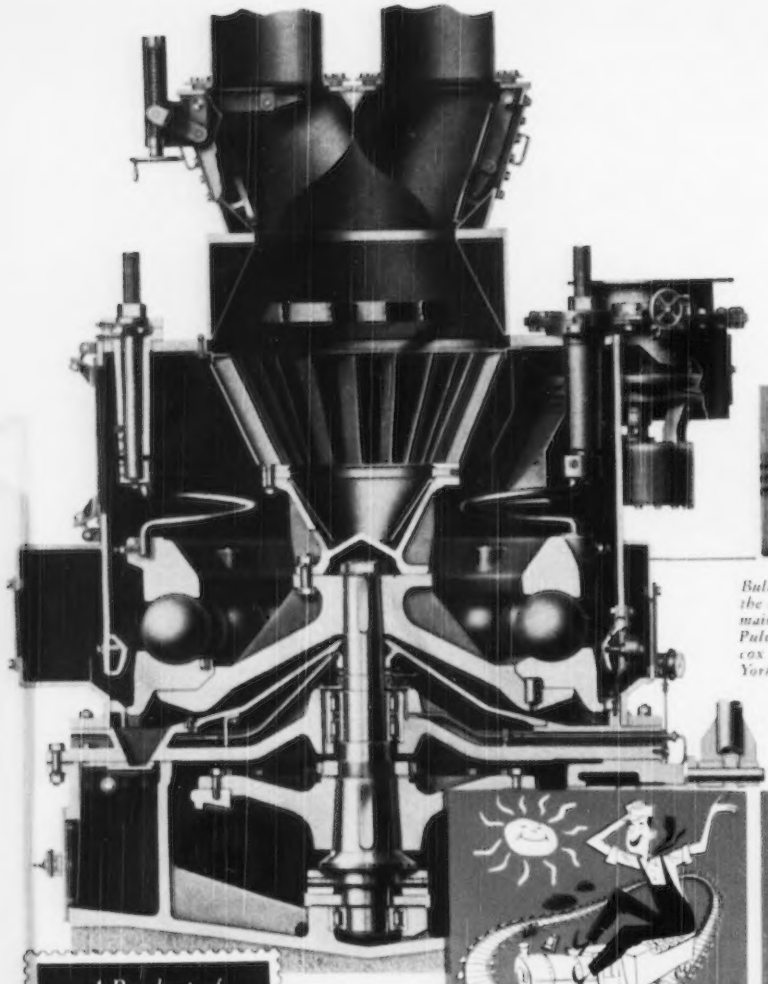
The BIDDLE business was and is being built on the faith of its customers in our ability to supply high quality instruments and personal service.

BIDDLE instruments enjoy the wide acceptance they do, because they have been dependable through long periods of service . . . They have been their own best salesmen. BIDDLE service files bear mute testimony to instrument after instrument that has served generations of workers . . . has amortized its purchase price long ago . . . and upheld the judgment of its original purchaser. Price tags and "specs" can't possibly reflect the quality or performance of a fine instrument or the integrity of its maker . . .

JAMES G. BIDDLE CO.
1316 ARCH STREET—PHILADELPHIA 7, PA.

Electrical Testing, Speed Measuring Instruments, Laboratory and Scientific Equipment — Established Since 1895

MEGGER® INSULATION AND RESISTANCE TESTERS • MEGGER GROUND RESISTANCE TESTERS • FRAHM® RESONANT REED TACHOMETERS • FRAHM RESONANT REED FREQUENCY METERS • JAGABI® TACHOMETERS AND SPEED INDICATORS • JAGABI LUBRI-TACT® RHEOSTATS



Bulletin G-57 illustrates and describes the design, construction, operating, and maintenance features of the Type E Pulverizer. Write: The Babcock & Wilcox Company, 85 Liberty Street, New York 6, New York.

A Product of B&W Engineering for Economy

Recirculating Load—Dries as It Grinds

Recirculation of fines within the mill gives repeated, quick-drying contact with large masses of heated air and metal . . . produces proper fineness at all loads, even with coal as wet as it can get. Fines are classified in the mill.

Uniform Performance Regardless Of Wear

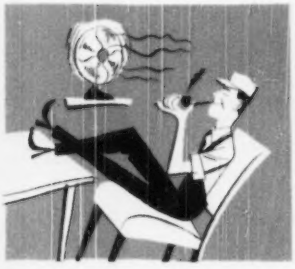
Balls and grinding rings wear together . . . assure uniform fineness regardless of attrition of the grinding elements . . . fineness automatically increases at reduced loads.

A big asset in *low-cost* power generation

The only accurate measure of pulverizer efficiency—*and ultimate cost*—is a function of availability, plus combined materials and labor maintenance per ton of product over long periods of continuous operation. B&W recently surveyed a representative group of utilities, covering a wide geographical area and broad range of coals. More than 100 B&W Type E mills were reported in service from one to ten years, and with aggregate product of 25 million tons:

- Average Availability: 96.5%
- Average total maintenance cost per ton: 3.12 cents

It will pay you to remember this outstanding—and typical—history of dependable, low-cost performance when considering your next pulverizer installation.



Blows Clean Air—Saves Wear and Tear

Unique in pressurized operation, the Type E Pulverizer requires remarkably little maintenance of the primary fan, because it blows only clean air . . . is not subject to the damaging abrasion of entrained particles.

One-Point Variable Fuel—Air Control

Like the accelerator on your automobile . . . assures proper coal-to-air mixture . . . produces desired rate of steam generation over a wide range with coal conditions suitable for sustained high combustion efficiency.

Low Power Consumption

Ball-and-ring grinding, anti-friction bearings, pressure lubrication, and automatic rejection of ungrindable materials make possible high output with minimum power demand.

Outstanding Performance Record

Availability and maintenance economy beyond today's most exacting requirements are proved in over 1300 Type E Pulverizer installations.

Helping Industry Cut Steam Costs Since 1867

BABCOCK & WILCOX

G-5191

DIRECT CURRENT

USERS—

BUFFALO ELECTRO-CHEMICAL ORDERS THIRD AND FOURTH I-T-E MECHANICAL RECTIFIERS

Here in a nutshell is the power conversion news of the year! After pioneering the first mechanical rectifier installation in the U.S.A., the management of Buffalo Electro-Chemical Company, Inc., Buffalo, N.Y., again has chosen the I-T-E Mechanical Rectifier to furnish power for a modernization program.

Deciding factors in Buffalo's decision were the mechanical rectifier's high inherent efficiency, small space requirement, low maintenance cost, and ease of operation.

The two original rectifier units, both rated at 3500 amperes, 260 volts d-c, have given 96.6% effici... their inst...

HERE'S NEWS FOR *You!*

MORE INDUSTRIAL ORDERS FOR MECHANICAL RECTIFIERS

Further power conversion news has been made by the following companies, who have placed orders for their first I-T-E Mechanical Rectifiers.

General Motors Corp.
Janesville, Wisc.

•

Hercules Powder Co.
Hopewell, Va.

•

Superior Gas & Equipment Co.
Philippine Islands

•

U. S. Metals Refining Co.
Carteret, N. J.

•

Marathon Paper Mills of Canada, Ltd.
Marathon, Ontario, Canada

•

Imperial Chemical Industries, Ltd.
Cheshire, Runcorn, England

•

Pennsylvania Salt Mfg. Co.
Wyandotte, Mich.

•

Fields Point Manufacturing Corp.
Providence, R. I.

These companies join the growing list of users of the ... mechanical rectifi... The many adv...

I-T-E

MECHANICAL RECTIFIERS

When you think of Electric Heat

think of Hoskins Chromel*

Honestly now . . . who'd have thought, a few years back, that electric heat would ever obsolete the old-fashioned clothes-line rope? And do a better job of drying clothes to boot . . . come fair weather or foul. Faster, easier, cleaner drying. Much more convenient . . . a whole lot more dependable. So what if it does cost more!

Yes, there's a good measure of "magic" in the quick acceptance won by new time-saving, work-saving electrical heating devices . . . whether they're for the home or for commercial or industrial use. An acceptance that comes from an unquestioning faith in their long-life dependable operating performance. And if you look around for the basic element directly responsible for this load-building buyer confidence, you'll find it in HOSKINS CHROMEL resistance alloy.

For CHROMEL, you know, is the *original* nickel-chromium alloy that *first* made electrical heating practical . . . It's highly resistant to oxidation. Possesses close-to-constant "hot" resistance between 700° and 2000°F. Delivers full-rated power throughout its long and useful life. And its consistent quality and fine durability are the combined results of over 40 years specialized research, manufacturing, and application experience devoted exclusively to . . . more and better use of dependable electric heat.

Our Catalog M-1 contains helpful information for your Load Building Department . . . want a copy?

HOSKINS MANUFACTURING COMPANY

4445 LAWTON AVE. • DETROIT 8, MICHIGAN

NEW YORK • CLEVELAND • CHICAGO

West Coast Representatives in Seattle, San Francisco, Los Angeles

In Canada: Walker Metal Products, Ltd., Walkerville, Ontario

**the original nickel-chromium resistance alloy that first made electrical heating practical*

. . . . for Improved High-Voltage Switching

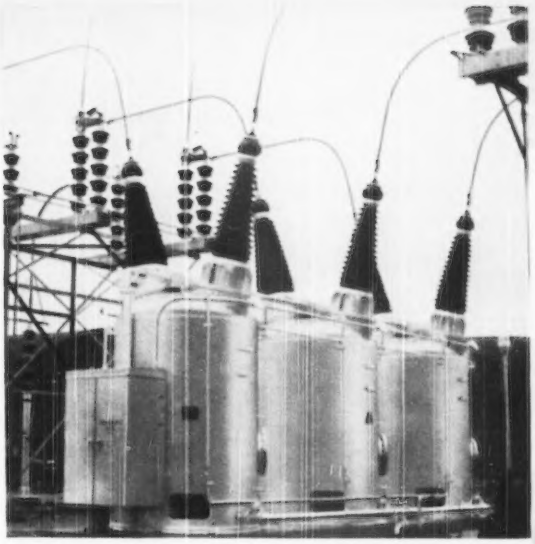
to 10,000,000 kva

Pacific Type RHE Oil Circuit Breaker

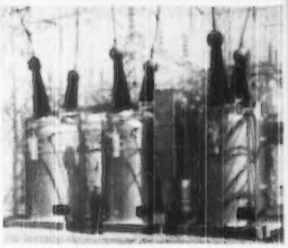
Described on the following pages

Kv	Amp to	Interrupting Kva to	3-cycle Interrupting
115	1200	5,000,000	
138	1200	5,000,000	10-cycle Closing
161	1200	7,500,000	
196/230	1200	10,000,000	20-cycle Reclosing*
230	1200	10,000,000	

*Reclosing time field-adjustable to any period from 15 to 45 cycles.

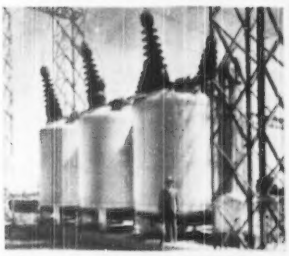


1950 The first of many 196/230-kv 3-cycle Pacific Type RHE circuit breakers now in use.



1945

Seven 196/230 kv Pacific breakers modernized the main bus of the first substation in America having 230-kv switching.



1929

An early 230 kv Pacific breaker, still in use.

1911

Pioneering the 115 kv ratings, these Pacific breakers were replaced by modern Pacifics in 1940.

1906

Pioneering the 60 kv ratings, these Pacific breakers are still in use—after 44 years. (Scheduled for replacement this year.)

These new circuit breakers have been installed, or are on order, by some of America's leading power systems—and by those of foreign countries.

PACIFIC ELECTRIC's Record of Achievement is why Pacific high-voltage switchgear is receiving increasing consideration by power systems, regardless of location.

This record is perhaps to be expected because Pacific's factories are in the region where nearly all high-voltage "firsts" were chalked up, and Pacific was an invited on-the-ground participant during many of these developments.

But a more particular reason is that Pacific has kept everlastingly at it—concentrating exclusively on high-voltage switchgear for 44 years—thereby providing a unique and invaluable experience-background for its highly competent engineering staff of today.

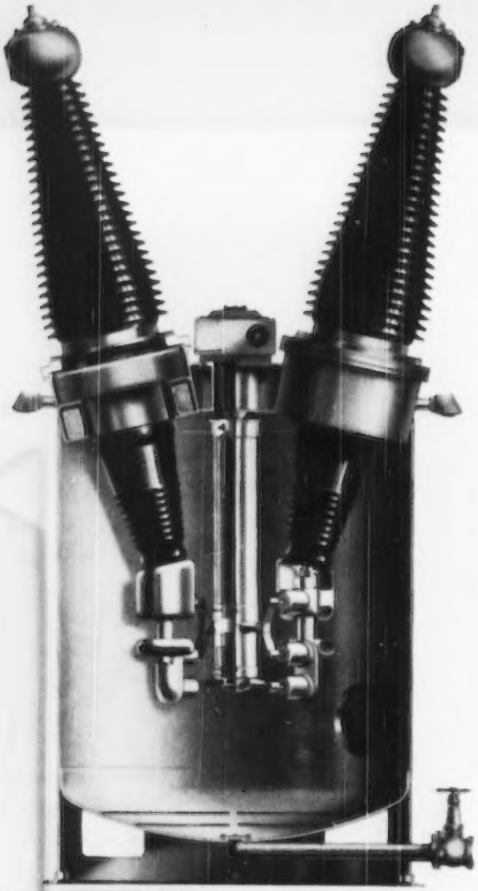
The Type RHE Circuit Breaker—described on the following pages—stems from the Grand Coulee Tests of June, 1948. It is Pacific's most recent contribution to switchgear progress.

PACIFIC ELECTRIC MFG. CORPORATION

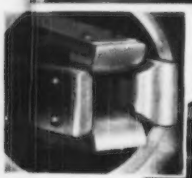
San Francisco 24, Calif. P. O. Box 419, Gary, Ind.

IGER
voltage

. . . . for Improved High-Voltage Switching

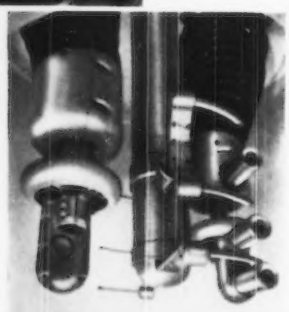


Above:
Sectional Elevation
196/210 kv Rating



At left:
OPEN

At right:
CLOSED



Above:
Sliding-Shoe Nested Contacts (with Interrupters Removed)

At right:
Interrupter and Bushing (one pole only)

PACIFIC ELECTRIC TYPE RHE
OIL CIRCUIT BREAKERS *for*

REDUCED MAINTENANCE
IMPROVED RELIABILITY

Verify the worth of each of these listed features in the light of your own experience

Only One Moving Element in the Tank

Moving as one piece, the rotary blade-structure provides six equal-length gaps in series per pole, totaling 80 to 96 inches, according to rating.

All gaps open at equal speed throughout entire stroke, and open fully before reclosing starts.

The rotary form permits adequate blade acceleration without need of auxiliary levers or multiplying linkage in the contact housings for increasing initial speed.

Nested Sliding-Shoe Contacts

No sensitive adjustments required to fix closed position.

Arcing does not affect surface carrying load current.

Wiping action smooths and cleans surfaces.

Leaf springs apply adequate pressure regardless of wear of the shoes; eliminates need of pressure adjustment.

As moving contacts do not charge auxiliary springs nor drive contact linkage, impact on bushings and battering of stationary contact shoes is negligible.

Improved Interrupters

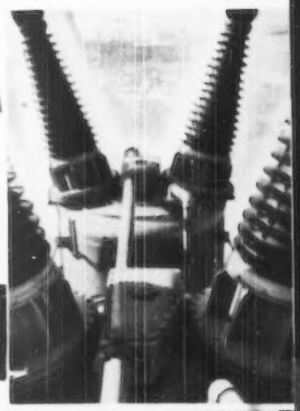
Oil blast interrupters confine thermal effects within the interrupting chambers. Oil is not directed into or alongside of arc path; however, relatively cool oil vapor rapidly replaces ionized portions. The usual large gas bubble does not form, with the result that ground shock and jar caused by oil displacement within the tank is eliminated.

Oil-gas separators are thereby rendered unnecessary, so are not used.

PACIFIC ELECTRIC
5815 THIRD ST., SAN FRANCISCO 24, CALIF.

PACIFIC "RHE" Oil Circuit Breakers

3-Cycle Interrupting
115, 138, 161, 230-kv
to
10,000,000 interrupting kva
(at 230 kv)



Looking Toward Pole No. 3

The pull rod contained within the compression tubes has means of compensating for unequal stretch in its sections, thereby assuring simultaneous operation of all poles.

Oil-Hydraulic Compressed Operating Springs

The compressed operating springs stand ready for action—for years, if necessary—without anything meanwhile having to move or operate.

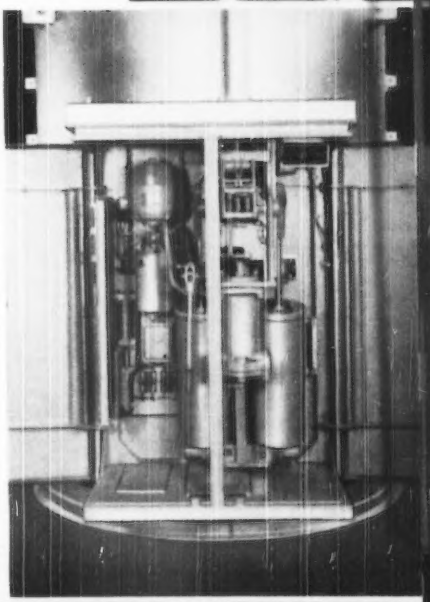
Operating-spring compression is by motor-operated oil-hydraulic jack which is under pressure only during compression of the springs.

Motor-Operated Main Mechanism

The opening and closing latches, the closing-energy system, oil-hydraulic decelerators, control circuits, and auxiliary switches are housed in dust-proof cabinet mounted on No. 1 pole. All operating forces are self-contained within compression tubes that surround pull rod and connect main and tank-top mechanism housings.

The velocity of any mechanism part (aside from the opening latch) does not exceed 8 ft. per sec. (the speed of a body falling one foot). Impact is thereby eliminated as a problem.

The mechanism is electrically and mechanically trip-free.



Main Operating Mechanism

with doors open. Shows oil hydraulic cylinder centered between double closing spring barrels.

Opening Forces Externally at Tank Tops

Each pole has individual external kick-off springs that apply opening force directly to the crank arm of the rotating unit. For ease of inspection, all opening toggle linkage is also outside of the tank. A follow spring at end of pull rod on No. 3 pole completes the opening stroke that was started by the tank-top kick-off springs.

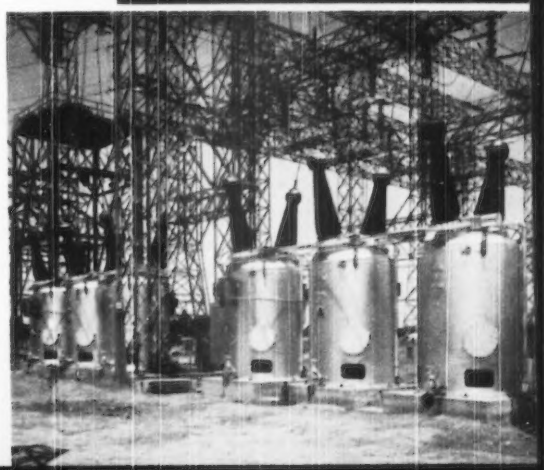
Emergency Manual Operation

Should control power fail, manual latch tripping provides a close-open or open-close-open sequence as necessary. If power remains off, two minutes operation of hand oil pump restores full operating energy.

Advanced Design

Integral assemblies and multiple functioning of parts greatly simplify and reduce number of parts and adjustment points. Mechanical linkage interlocking eliminates need for an anti-pumping relay, and reduces the number of position-check switches to only one, etc.

Below:
Two 196/230-kv Type RHE's on the line.

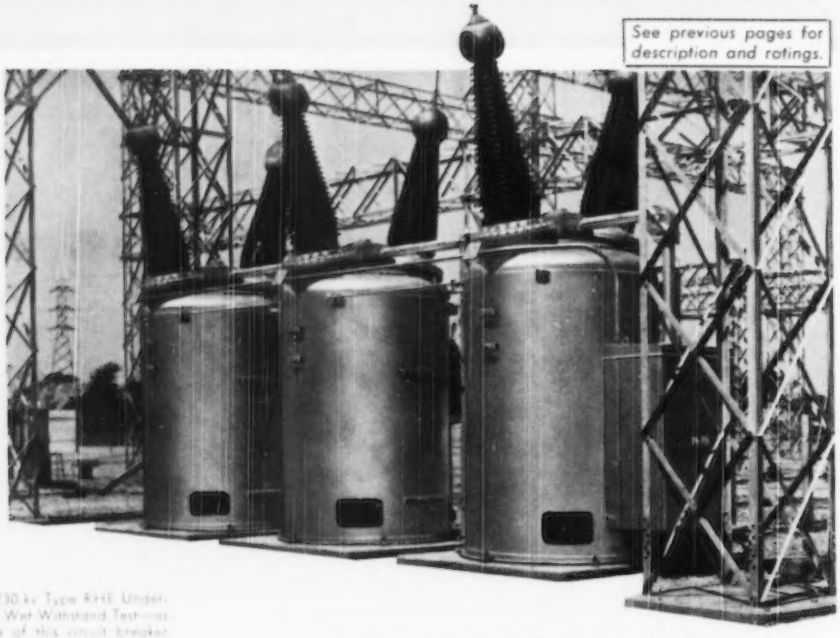


MFG. CORPORATION

P. O. BOX 419, GARY, INDIANA

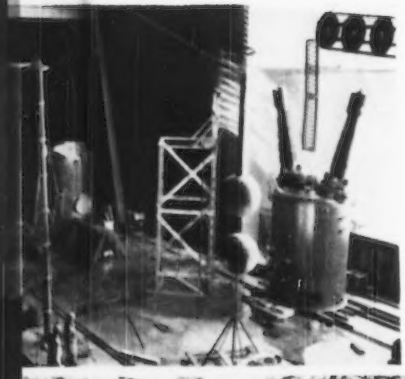
PACIFIC "RHE" Oil Circuit Breakers

See previous pages for description and ratings.



At right:
196,230-kv Type RHE in service. One of an installation of seven at this site.

Below:
Single-Pole Unit of 230-kv Type RHE Undergoing High Potential Wet Withstand Test—as required in the case of this circuit breaker which was shipped to France.



TESTS AND PERFORMANCE

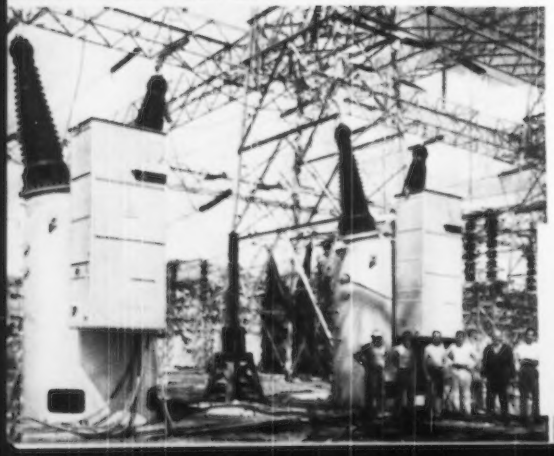
Pacific Type RHE Oil Circuit Breakers are manufactured and tested in accordance with Standards of AIEE, ASA, and NEMA.

The design interrupting tests were conducted on prototype circuit breakers at the Grand Coulee Switchyard in June, 1948, at which time a series of fault interruptions was made up to the full power then available at the site, 9,620,000 kva on a 3-phase ASA basis (see illustration at lower left).

Insulation-level withstand tests (60-cycle and impulse), exploration of internal dielectric field, etc., were made at the Ryan High Voltage Laboratory. The 1000-operation test, heat runs, and the high-current tests were conducted by the Company.

Though ratings to 10,000,000 kva are at present available, the Type RHE embodies principles that provide a flexible basis for later modification to meet probable future requirements of increased interrupting ratings and other operating characteristics.

Apply to the Company, or its nearest representative, for table of ratings and further information.



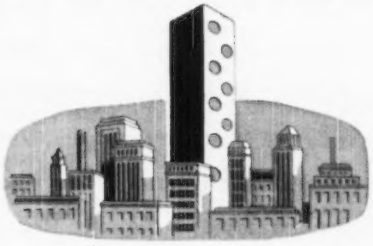
At left:
Two Single-Pole Units of the Prototype Circuit Breakers with Test Crew on Grand Coulee Switchyard, June 1948, After Completion of Interrupting Tests

PACIFIC ELECTRIC MFG. CORPORATION

5815 THIRD ST., SAN FRANCISCO 24, CALIF.
P. O. BOX 419, GARY, INDIANA

Want to carry power vertically?

THEN...*Chase Square Copper Tube Bus Conductor is the way to handle it*



Chase Square Copper Tube Bus Conductors have 10 important features that make a *big difference*—mean *better* vertical power transmission in *multi*-story buildings. These are:

- Square, tubular shape, which means more rigid construction
- Greater mechanical strength to resist the stresses of short circuits
- Four flat sides for secure floor anchorage and easier assembly
- Efficient and economical connections to power-and-light panels
- No downward-sliding insulation to leave thinly protected areas
- Excellent current-carrying capacities
- Extreme resistance to corrosion
- Generally require only one tube per phase
- Minimized "skin effect"
- Triangle-formation of Bus Conductors possible, resulting in equal spacing and equal voltage between phase conductors.

For complete information about Chase Square Copper Tube Bus Conductors, write to Dept. EW 1050, for the Chase Bus Conductor Handbook.

Chase

the Nation's Headquarters for
BRASS & COPPER

WATERBURY 20 CONNECTICUT

SUBSIDIARY OF KENNECOTT COPPER CORPORATION

THIS IS THE CHASE NETWORK . . . *handiest way to buy brass*

ALBANY† ATLANTA BALTIMORE BOSTON CHICAGO CINCINNATI CLEVELAND DALLAS DENVER† DETROIT HOUSTON† INDIANAPOLIS KANSAS CITY, MO. LOS ANGELES MILWAUKEE MINNEAPOLIS NEWARK NEW ORLEANS NEW YORK PHILADELPHIA PITTSBURGH PROVIDENCE ROCHESTER† ST. LOUIS SAN FRANCISCO SEATTLE WATERBURY †Sales Office Only

needed 1000 producers

Ordinarily, the needs of this Country (and many others) for conductor and strand are amply satisfied by the many fine American manufacturers of wire and cable. But now . . . and for some time into the future . . . when loads are mounting and demands for and on transmission systems are reaching unprecedented levels . . . when shortages of men and materials are developing . . .

You must be a producer of conductor . . .

HOW?

1. By rehabilitating and reinstalling old conductors.
2. By increasing the current-carrying capacity of existing lines.
3. By lengthening the life expectancy of present and future lines.

Preformed Armor Rods are for use under Patent No. 2,275,019 . . . other patents pending.

Preformed Armor Rods are furnished in half sets for splicing and/or repairing.

YOUR EQUIPMENT

All you need are Preformed Armor Rods and a *Pair* of hands for:

1 — Splicing, armoring at supports and dead-ends.

2 — Repairing conductors and strand in place or in your salvage yard for reinstallation.

3 — Jumpers for old splices.

# of conductor and strand...

Preformed Armor Rods will . . .

- **INCREASE** the current capacity of splices, conductors in clamps, dead-ends and so on, by more than 30%.
- **LENGTHEN** the life of conductors where vibration, arcing and burning take their toll.

Easily installed in three minutes . . . even by inexperienced linemen . . . Preformed Armor Rods protect conductors better and at lower cost than ordinary armor.

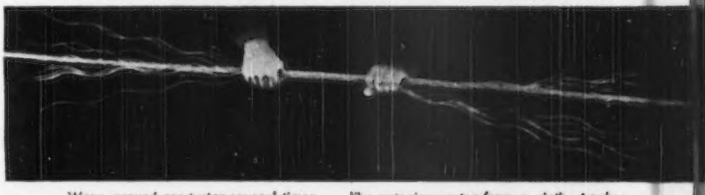
They are better because only PLP rods grip uniformly over the entire conductor length.

They are less expensive because your linemen make perfect installations every time, far quicker than with ordinary armor. Less expensive because only PLP rods eliminate concentrated stresses common in other forms of conductor protection.

Complete technical details and installation records are available. Just write to: *PREFORMED LINE PRODUCTS COMPANY, 1051 Power Avenue, Cleveland 14, Ohio.*

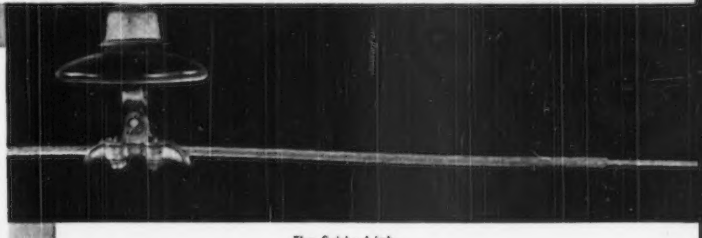
PLP ARMOR RODS ARE AVAILABLE IN ALUMINUM, COPPER, BRONZE, COPPERWELD, STAINLESS STEEL AND GALVANIZED STEEL—A TYPE FOR EVERY CONDUCTOR.

Take half to all of the rods needed and lay them across and around the conductor.



Wrap around conductor several times . . . like wringing water from a cloth. Apply remainder of rods.

Continue wiping action along conductor.



The finished job.

PREFORMED

PLP

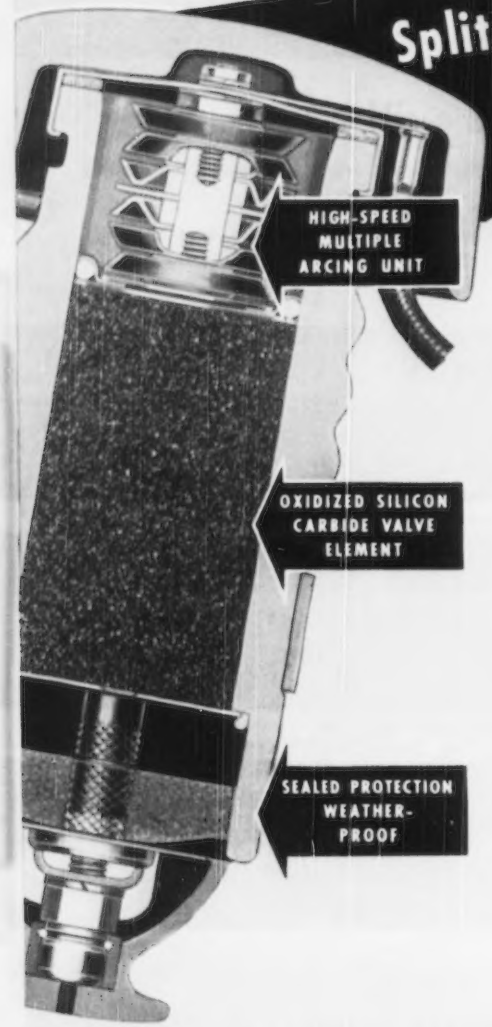
LINE PRODUCTS CO.

CLEVELAND 14, OHIO

NEW CONDUCTORS?

Naturally, you will want to spend only 2 to 3% of new conductor cost to eliminate vibration damage, clamp and tie damage, burning and slipping.

Split Second Protection
High Surge Discharge
Long Life!



Low Voltage Drop—Extremely Marked Valve Action . . .

Speed and superior valve action of Crystal Valves have set a high standard of lightning protection for the world's power lines.

Crystal Valves stand guard over equipment and service at all times. Their weatherproof construction withstands the heat of summer . . . the cold of winter, thus assuring long life split second protection. Crystal Valve research offers:

- **Gasketed copper sealing cover.**
- **Line lead moisture shield.**
- **High-speed multi-gap structure.**
- **Accurately ground Steatite spacers.**
- **Oxidized Silicon Carbide Valve Element.**
- **Wet process porcelain body and cap.**
- **Drip petticoats on cap and body.**

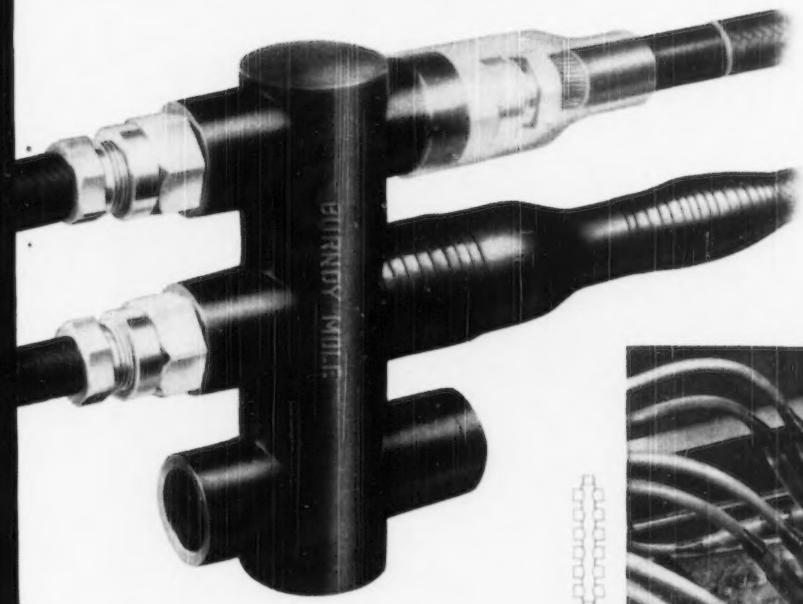
Get the latest technical data on lightning arrestors and their installation. Let us put your name on the list to receive a series of informative technical booklets. No obligation.

ELECTRIC SERVICE MANUFACTURING CO. • 1709 Cambria St. • Philadelphia 32, Penna.

CRYSTAL VALVE
LIGHTNING ARRESTERS

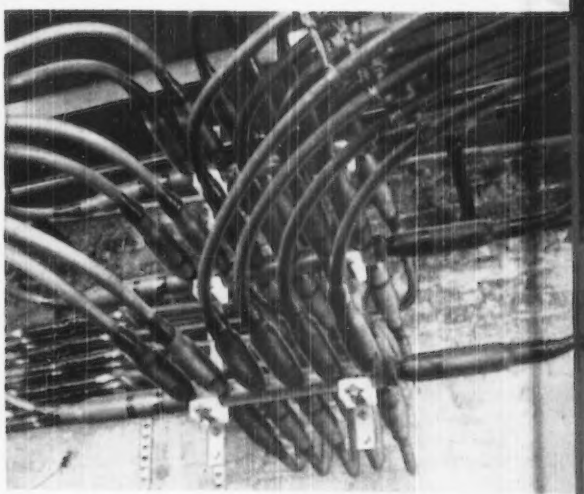
top flexibility underground

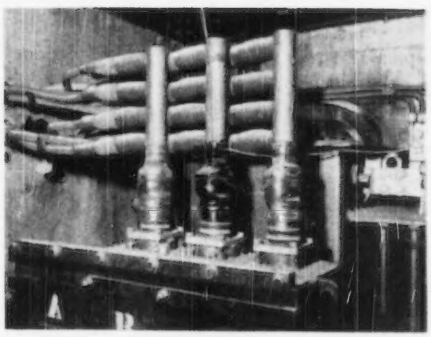
Burndy Mole Line Equipment Permits Orderly Expansion Of Secondary Networks



With the installation of Burndy Mole Line Equipment your system is prepared to handle added loads—quickly at low cost.

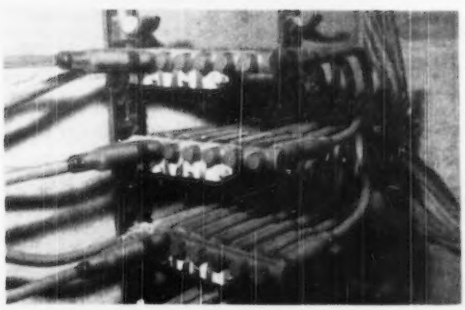
Multiple outlets in the Mole can be reserved for future use, each outlet takes a range of cable sizes to permit substitution of larger conductor when required . . . and Moles can be interconnected as the network expands.





If cable protection is required, Molimiters can be assembled to Moles without addition of parts.

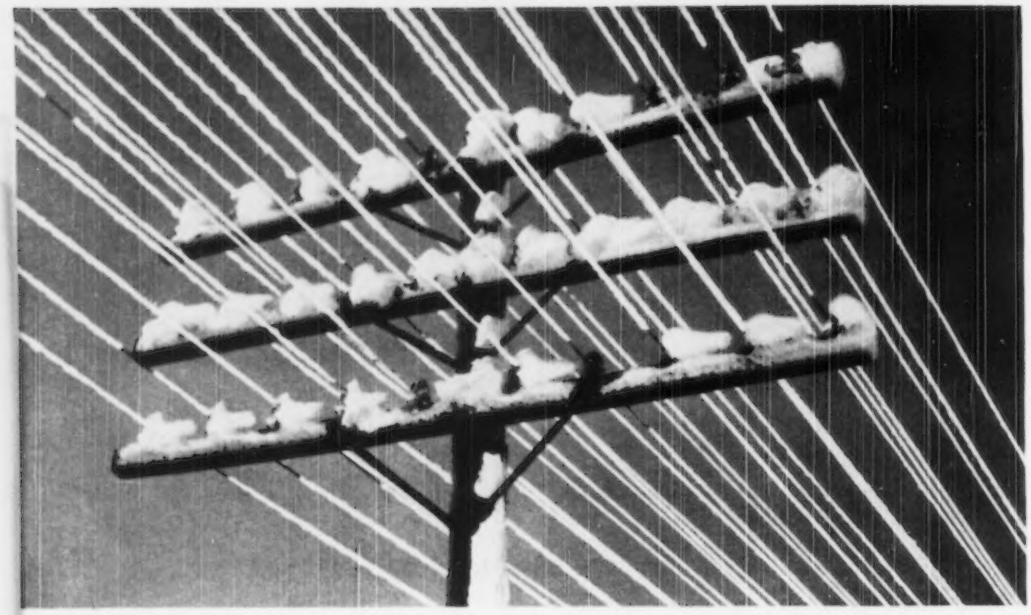
Without obligation, call upon the Burndy Representative to explain the versatility of Mole Equipment to meet your requirements. Write for Catalog Z-47.



BURNDY MOLE

BURNDY · NEW YORK 54, N. Y.

WHEREVER YOU USE WOOD...



IN THE NORTH, poles must resist the tremendous weight of frequent sleet storms. Avoid preservatives which *weaken* the wood. BARRETT* Coal-Tar Creosote allows poles to retain their maximum strength, and helps to keep the poles at their best and hold the lines aloft.

IN THE DESERT, crossties broom, shatter and split from extreme dryness and heat. Solutions made with BARRETT Coal-Tar Creosote retard this, and also reduce mechanical wear of crossties through their lubricating action on the wood fibers. In poles, heavy treatment with BARRETT Coal-Tar Creosote substantially reduces checking and splitting.

IN THE SOUTH, prolonged high temperatures cause light-bodied preservatives to leach and evaporate from the wood, thus exposing the wood to termite attack and decay. BARRETT Coal-Tar Creosote, heavier bodied and of lower volatility, prevents this condition. It stays in the wood longer under all conditions—doesn't "run out" on the job.

IN THE SWAMPS, forces of decay are almost at their maximum of destructive power. High moisture content and infection from other decaying wood and debris are ever-present menaces. Poles properly treated with BARRETT Coal-Tar Creosote have survived under swamp conditions for years.

IN FRESH WATER, many preservatives leach out of wood. BARRETT Coal-Tar Creosote resists this leaching action. Being only negligibly soluble in water, it is the preferred preservative for use on submerged wood structures, or those exposed to the powerful action of rapidly flowing water.

IN SALT WATER, marine wood-borers give a preservative its severest test. Of hundreds of preservatives that have been tried through the years, *Coal-Tar* Creosote is the only one that has proved consistently effective against teredos, limnoria and other salt-water enemies of wood.

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

Use Barrett*

*Reg. U. S. Pat. Off.

Only coal-tar creosote wood preservative has been used long enough and widely enough to have proved its effectiveness under all conditions.

COAL TAR CREOSOTE

LOOK for the Stackpole Minute Man . . . your guarantee of expertly engineered molded materials.
Specialists for over a third of a century in MOLDED CARBON, GRAPHITE, METAL POWDERS, and MOLDED COMPOSITION MATERIALS.
STACKPOLE CARBON CO., ST. MARYS, PA.
STACKPOLE
BRUSHES AND CONTACTS
(All carbon, graphite, metal, precious metal, and composition types)
SINTERED ALNICO II
PUMP and FLUID DRIVE SEALS
IRON CORES
COIL FORMS
CARBON PIPE
BRAZING TIPS
WELDING CARBONS
CHEMICAL CARBONS
CARBON RHEOSTAT PILES
CARBON DISCS
FLASHLIGHT BATTERY CARBONS
POWER TUBE ANODES
ELECTROLYTIC ANODES
FIXED & VARIABLE RESISTORS, etc., etc.
Data on any type on request

New Outdoor Current Transformer Type KO

Type KO Outdoor (compound-filled) current transformer. Available in standard current ratings up to and including 800 amperes and three voltage classes: 5, 8.7 and 15 KV.

Mounts in Any Position

Type KO current transformers solve your installation problems in more ways than one. Mount on frame, pole or platform, in any position to meet your system requirements.

ALLIS-CHALMERS
CURRENT TRANSFORMERS

Highly Accurate on Metering Burdens

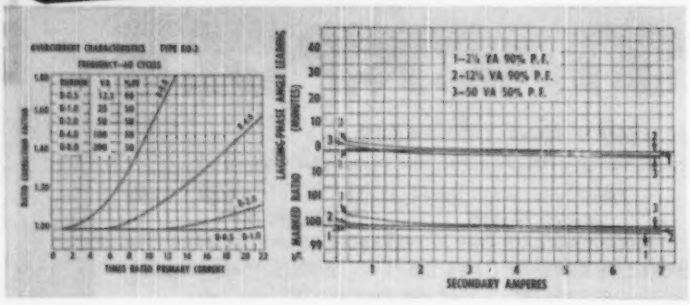
NEW VERSATILITY in mounting . . . high accuracy in metering and heavy-duty relay application — that's the story on the new Type KO out-door current transformer. Linemen like it because they can install it quickly, easily in any position.

Primary leads are brought out conveniently to blade type terminals through a porcelain bushing designed with generous creep surface. Secondary leads terminate in a weather-proof terminal box. Box cover readily swings open after loosening the barrel type locking bolt — no parts to drop or lose. Secondary connection through conduit openings made to stud type terminals in this sealable compartment.

Type KO transformer housing is completely welded, pressure tested and hermetically sealed. Maximum insulation strength is achieved by compound filling under a "vacuum-pressure" process which entirely eliminates air. This results in low power factor and a maintenance-free installation.

For more information on Allis-Chalmers wide range of instrument transformers write for bulletin 61B7168 or see your nearby A-C sales representative. A-3143

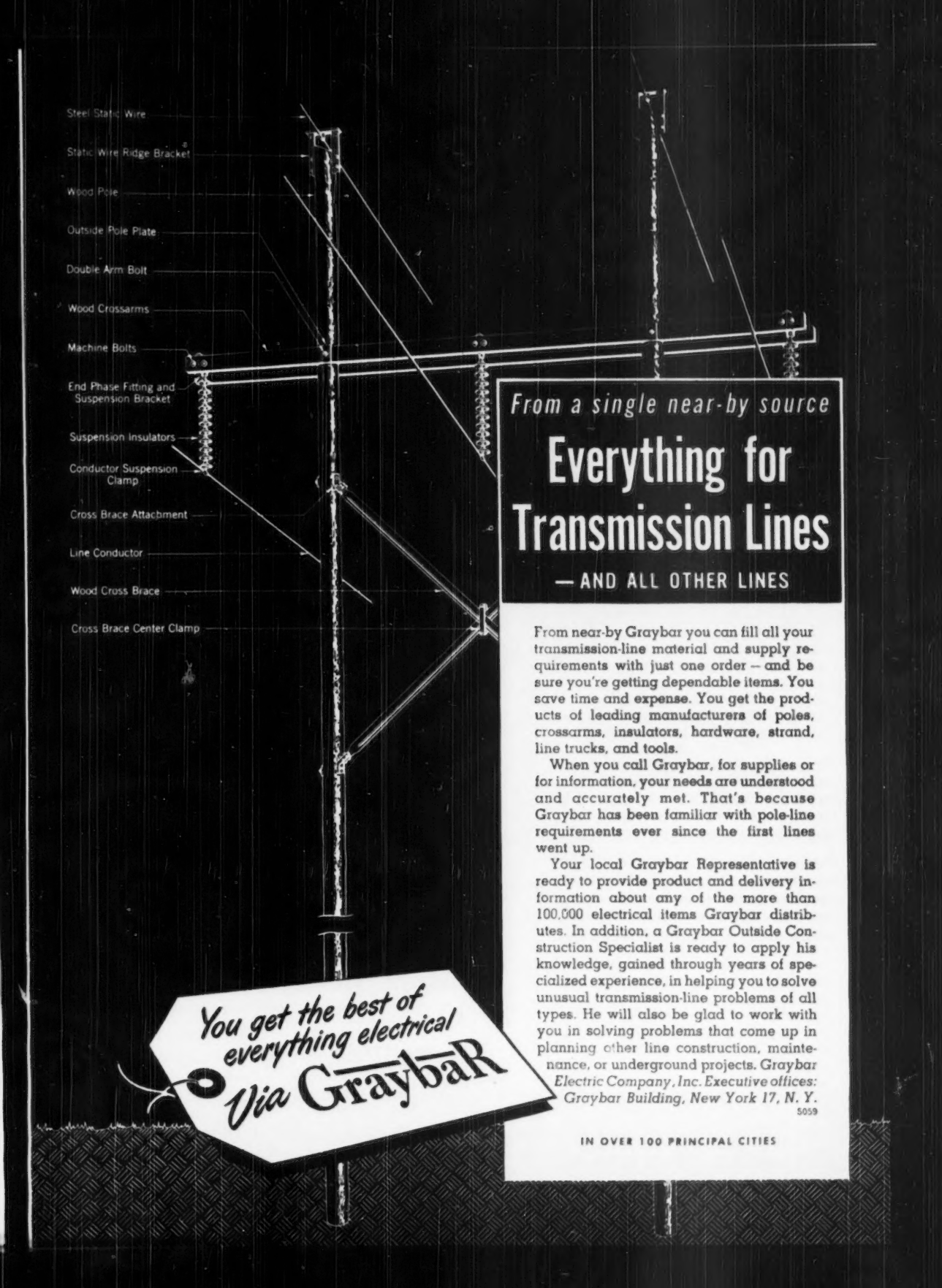
ALLIS-CHALMERS, 932A SO. 70 ST.
MILWAUKEE, WIS.



The excellent performance of Type KO current transformers is represented in the above curves. They meet or better ASA and NEMA standards.

ALLIS-CHALMERS

Pioneers in Power and Electrical Equipment from Generation through Utilization



From a single near-by source

Everything for Transmission Lines

— AND ALL OTHER LINES

From near-by Graybar you can fill all your transmission-line material and supply requirements with just one order — and be sure you're getting dependable items. You save time and expense. You get the products of leading manufacturers of poles, crossarms, insulators, hardware, strand, line trucks, and tools.

When you call Graybar, for supplies or for information, your needs are understood and accurately met. That's because Graybar has been familiar with pole-line requirements ever since the first lines went up.

Your local Graybar Representative is ready to provide product and delivery information about any of the more than 100,000 electrical items Graybar distributes. In addition, a Graybar Outside Construction Specialist is ready to apply his knowledge, gained through years of specialized experience, in helping you to solve unusual transmission-line problems of all types. He will also be glad to work with you in solving problems that come up in planning other line construction, maintenance, or underground projects. *Graybar Electric Company, Inc. Executive offices: Graybar Building, New York 17, N. Y.*

5059

IN OVER 100 PRINCIPAL CITIES

YOU'RE 7 ways SURER WITH TEMFLEX 105

Longer Life at 105°C!

Temflex 105 extruded plastic tubing affords longer retention of flexibility and original insulation characteristics. Use it for higher operating temperatures, for high voltage conductors, for oil-cooled transformers. For details, test reports, samples, write today.

Look to Irvington
for Insulation Leadership

ENDURES HEAT – Temflex 105 is Underwriters' Laboratories approved for continuous operation at 105°C!

SUPERIOR INSULATION – Temflex 105 maintains consistently high dielectric strength!

MOISTURE RESISTANT – Temflex 105 effectively seals out moisture – is Underwriters' approved for use in damp locations!

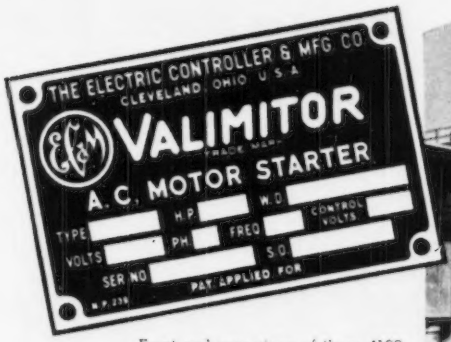
STRONG, TOUGH – Temflex 105 gives you tensile strength of 3,000 p.s.i. – with minimum elongation of 300%!

FLEXIBLE WHEN COLD – Temflex 105 stays flexible down to temperatures as low as –40°C!

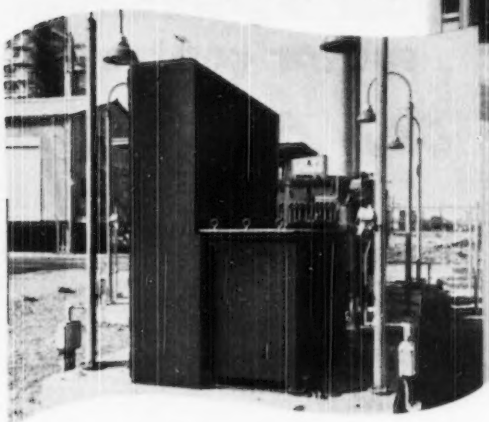
RESISTS CHEMICALS – Temflex 105 shows good resistance to solvents, is unaffected by strong acid or alkali!

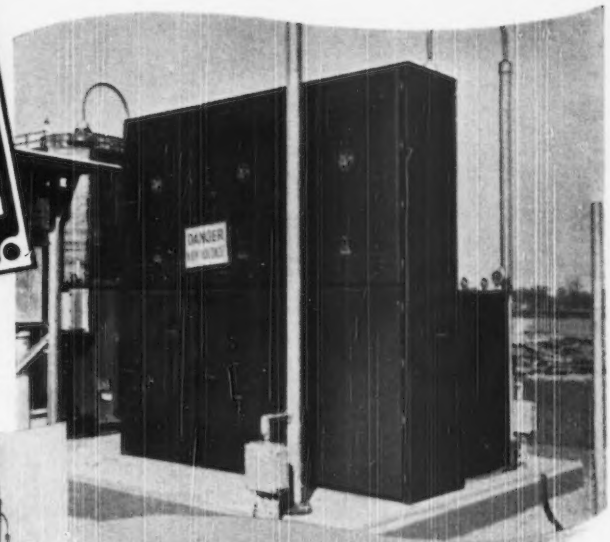
WITHSTANDS HOT OIL – Temflex 105 retains flexibility and dielectric properties after prolonged immersion in oil over 100°C!

IRVINGTON VARNISH & INSULATOR COMPANY
Irvington 11, New Jersey



Front and rear views of three 4160 Volt EC&M Valimitor Starters installed outdoors in an Ohio refinery.





Short Circuit Protection

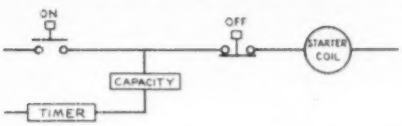
IS UNLIMITED WITH THESE

4160 VOLT VALIMITOR STARTERS

(VOLT-AMPERE-LIMITOR)

MAGNETIC-LATCHED

UNDER VOLTAGE PROTECTION STARTERS



These starters are provided with a new Under Voltage Protection system which keeps the motors "on the line" on voltage dips or on momentary losses of power. The starter-contactor is latched in magnetically down to about 25% of normal voltage. Full spring pressure is maintained on the contacts and should voltage drop further, the contactor drops out cleanly, eliminating the danger of welded contacts under reduced spring pressure. A small timing relay keeps the push button operating coil circuit "active" for about 2 seconds so that the motor will re-start if normal voltage returns within the timing of the relay.

No fuses to blow or replace—instead, the circuit is opened directly by the well-known EC&M Type ZHS heavy-duty, magnetic Contactor, with maximum fault current limited to 25,000 KVA or less (steady state current)—the KVA may be infinite. Protection *does not lapse* under *any* condition, protection is continuous from a minor to a maximum fault.

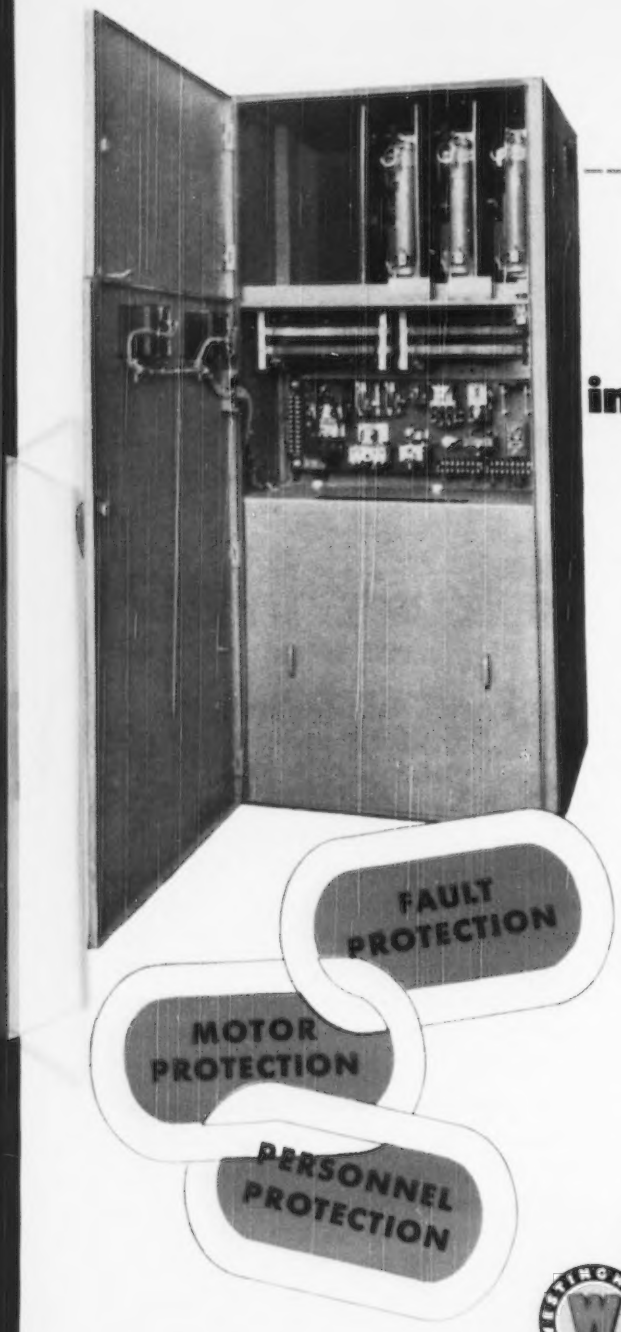
Other inherent features are—cushioned starting, combined instantaneous trip and accurate overload protection from magnetic, adjustable, non-creeping overload relays, simplified purchasing, no calculations of existing KVA or estimate of future growth. Write for T9-117 Reprint Bulletin.

THE ELECTRIC CONTROLLER & MFG. CO.

2698 EAST 79TH STREET ★ CLEVELAND 4, OHIO

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



ONE WEAK LINK

in your high-voltage motor control

CAN BE COSTLY

2300-4800 voltage systems pack a punch! It takes more than just a starter for *safe* control of motors connected to these systems.

What's the answer? The three-way co-ordinated protection of Westinghouse Combination High-Voltage Starters. They combine high interrupting capacity with motor and personnel protection—in one unit. Contactors and fuses, as well as all other components, are designed for each other . . . made to work together . . . balanced for the best results.

Each link of this three-way protection is of equal importance. You get positive fault protection with type BAL fuses. Heavy-duty contactors—either oil-immersed or air-break type—guard the motor. Sectionalized cabinets offer protection for personnel.

Ask your Westinghouse salesman to give you full details and a copy of "Co-ordinated Protection", booklet B-4673. Or, write directly to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-27005

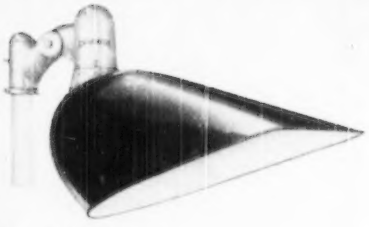
Westinghouse

HIGH VOLTAGE STARTERS

ELIPSO STANDLITE—
Expertly designed to provide protection for industrial properties.

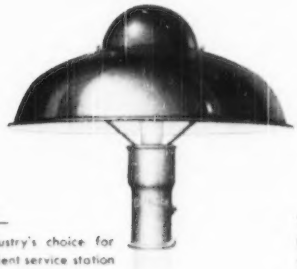
SENTINELS OF SAFETY

APPLETON LIGHTING EQUIPMENT

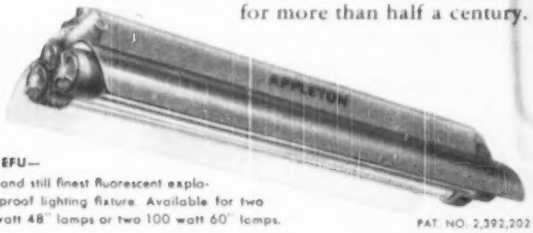


DIFFUSO FLOODLIGHT—
For even illumination of service stations, athletic fields, parking lots, etc. Pole, Bracket or Crossarm mounting.

In these days of accelerated production, good light for outdoor working areas and grounds is a vital *must* for both personnel safety and plant protection. Outdoor lighting planned with Appleton Equipment is your assurance of top-notch illuminating efficiency at minimum installation, service and operating expense. Appleton Lighting Fixtures are available in the exact type and size for every industrial requirement—including hazardous locations—whether indoors or out. For the finest in illuminating fixtures specify Appleton—pace-setting manufacturer of electrical equipment for more than half a century.



STANDLITE—
The oil industry's choice for sturdy, efficient service station illumination.



THE EFU—
First and still finest fluorescent explosion-proof lighting fixture. Available for two 40 watt 48" lamps or two 100 watt 60" lamps.

PAT. NO. 2,392,202

Sold Through Electrical Wholesalers

APPLETON ELECTRIC COMPANY

1703 WELLINGTON AVENUE • CHICAGO 13, ILLINOIS

Branch Offices: NEW YORK, 50 Church St. • DETROIT, 3049 E. Grand Blvd. • CLEVELAND, 1836 Euclid Avenue • SAN FRANCISCO, 655 Minna St. • ST. LOUIS, 227 Frisco Bldg. • LOS ANGELES, 100 N. Santa Fe Avenue • ATLANTA, 724 Boulevard, N. E. • BIRMINGHAM, 429 Brown-Marx Bldg. • MINNEAPOLIS, 305 Fifth St. S. • PITTSBURGH, 414 Bessemer Bldg. • BALTIMORE, 100 East Pleasant St. • BOSTON, 10 High Street • DENVER, 1921 Blake Street • PHILADELPHIA, 1017 Cherry Street • CINCINNATI, 626 Broadway • HOUSTON, 709 M. & M. Bldg. • HAVANA, Cuba, Malecon No. 9.

Resident Representatives: Binghamton, Dallas, Indianapolis, Kansas City, Orlando, Milwaukee, New Orleans, Seattle, Portland, Ore.

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APPLETON

CONDUIT FITTINGS • LIGHTING EQUIPMENT • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • REELITES

OVER 7 BILLION KVAR

of capacitor

CORNELL-DUBILIER Capacitors

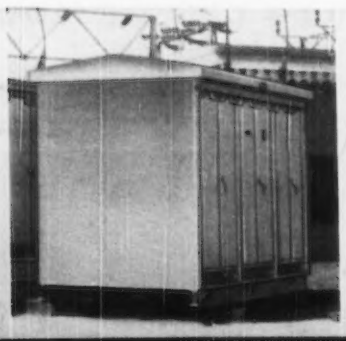
FOR POWER-FACTOR IMPROVEMENT

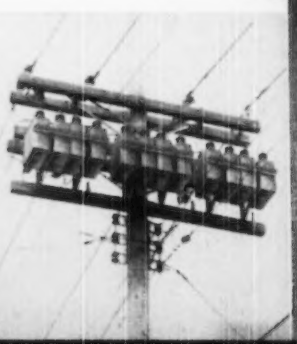
C-D power-factor capacitors are field proved! Here's evidence: 7,007,763,480 Kvar hrs. of capacitor service at P. S. E. and G. of N. J.

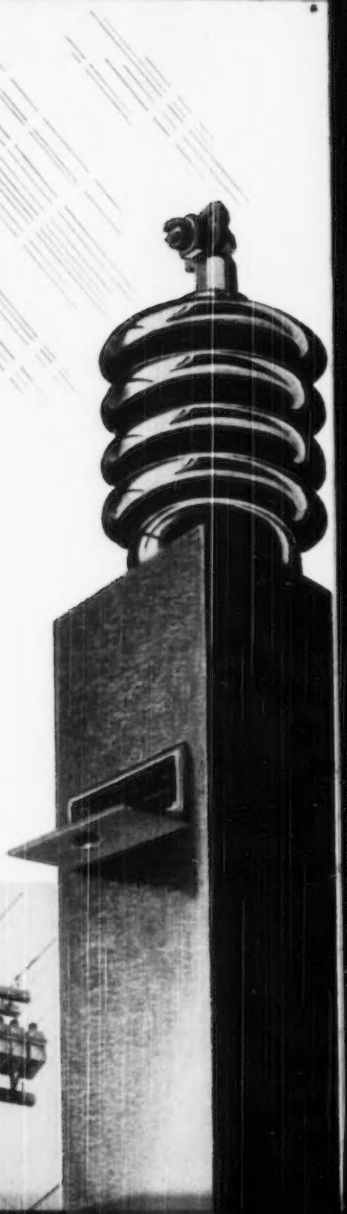
Several of these C-D installations have been in continuous service for more than a decade with little or no maintenance. Yet, they're still performing as dependably as the last C-D unit installed by P. S. E. & G.

Proof that C-D's specialized experience in the power-factor field means more capacitor value for your dollar!

Among the many other reasons why C-D capacitors, both pole and station type, have given so many years of satisfactory service under the severest operating conditions is C-D's engineering standards which provide for the lowest dielectric unit stress and highest major insulation level. C-D station type capacitors can be provided in weatherproof housings, switched or unswitched and completely assembled for energizing at field site, to meet specific sub-station needs.

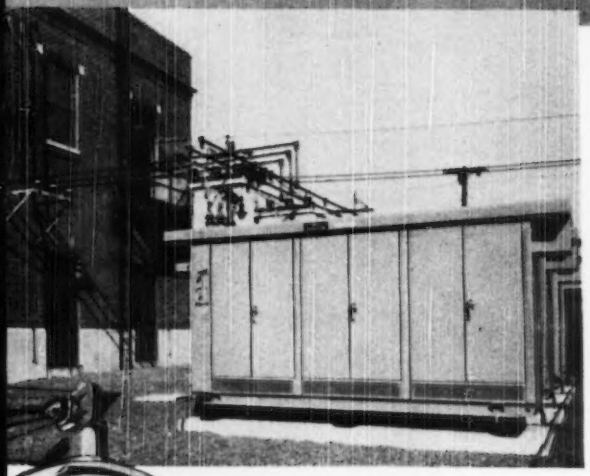






HRS. service

at PUBLIC SERVICE ELECTRIC AND GAS of New Jersey



RACKS COMPLETELY ASSEMBLED AT THE FACTORY!

Evidence of the practical design and construction of this C-D station type rack equipment: *It's completely assembled at the factory, and shipped ready for field energization.* This time-conserving, money-saving feature is typical of C-D's leadership in maintaining the highest engineering standards in the capacitor field at the lowest possible cost.

IN CONTINUOUS SERVICE

A typical C-D capacitor installation at P. S. E. and G. of N. J. — one of several sub-stations showing 7,920 Kvar station-type capacitors of a total of 134,961 Kvar. Designed to maintain stable bus voltage level during periods of maximum load in a highly concentrated industrial area.

More reasons why C-D capacitors have met P. S. E. & G. field performance requirements!

- Lowest dielectric unit stress and highest major dielectric insulation level!
- Dykanol-filled bushings increase accepted flash-over safety factor, insure high level of impulse withstand!
- Removable solderless connectors instead of permanent split-stud assemblies!
- Many small sections in series-parallel connection. Extremely low voltage gradient per section; less heating; no corona; longer life; lower power-factor; lowest dielectric unit stress.
- Terminal discharge resistor connected to each series section, instead of terminal to terminal. Provides effective discharge for each series group and balanced voltage distribution.
- C-D design results in the lowest volt-amperes per square inch of radiating surface.

Get these cost-saving capacitor extras — Only available with C-D's. A C-D field engineer will be glad to discuss your specific requirements for power-factor improvement. *Write for catalog today.*

CORNELL-DUBILIER ELECTRIC CORP., Dept. D-100, South Plainfield, N. J.

Other plants in New Bedford, Worcester and Brookline, Mass.; Providence, R. I.; Indianapolis, Ind.; and Cleveland, Ohio.

40TH ANNIVERSARY CORNELL DUBILIER CD CAPACITORS 1950

CORNELL-DUBILIER

CAPACITORS

BEST BY FIELD TEST

Service Restored

faster than ever after ice storm . . .

ICE storms are a utility's nightmare. Recently, the Missouri Public Service Corporation had a beauty on its hands. Driven by high velocity winds, heavy sleet lashed trees and roads, coated them with 6 to 8 inches of ice, pulled down hundreds of miles of line in the 17-county service area.

Thanks to *instant communication* made possible by General Electric 2-way radio in line trucks and supervisors' cars, service was restored at least 5 to 4 days earlier than would have been possible without the use of radio, according to officials at company headquarters in Warrensburg.

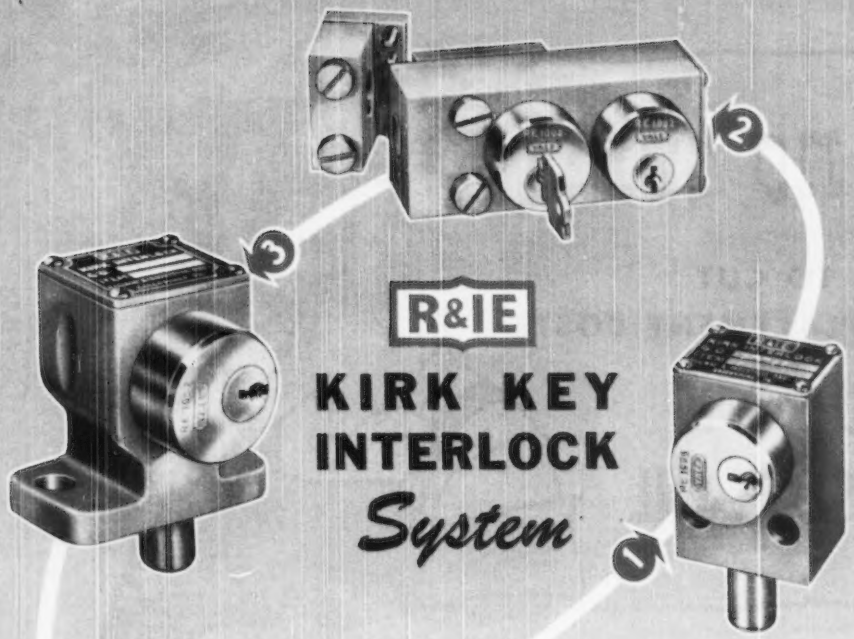
Utilities in every state use G-E 2-way radio to coordinate planned interruptions, to save manhours, truck hours, time on outages. Let our engineers study your communication problem, too—there's no obligation. Write: *General Electric Company, Section 19100-23, Electronics Park, Syracuse, N.Y.*

YOU BE THE JUDGE — CHECK THESE ADVANTAGES

Equipment Features	General Electric	Manufacturer A	Manufacturer B
Triple-Tuned Transformers (high selectivity with fewer tubes)	Yes	No	No
At Least 2 Watts Peak Audio Output	Yes	No	No
Instantaneous Modulation Limiting	Yes	Yes	No
Number of Tubes	18	26	22
Cost per Set of Tubes	$24.50	$50.16	$31.79
Spurious Radiation at any Frequency	65 db	60 db in the band only	60 db
Cable Junction Box	Not Required	Required	Not Required
Key Lock for Protection of Every Unit	Yes	Optional at Extra Cost	Not Available
Microphone Quick Release Plug	Yes	Not Available	Not Available
20 kc & 40 kc Receiver Selectivity	Yes	No	No
Two-Unit Design for Maximum Mounting Flexibility	Yes	No	No

You can put your confidence in—

GENERAL ELECTRIC



R&IE

KIRK KEY INTERLOCK *System*

KEY . . . YOUR OPERATIONS FOR SAFETY

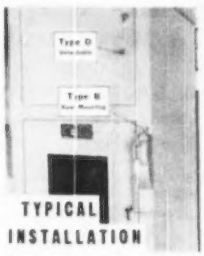
Kirk Key Interlock Systems prevent the authorized person from doing the unauthorized thing! Added safety for your installation and equipment is provided by this device which is applied to two or more movable parts, preventing or allowing movement of one part only when another part is locked in a predetermined position. Unlimited operating schemes can be arranged in electrical installations, processing systems, fluid and pneumatic systems, etc., from combinations as shown, or multiple units of any one of them. Individual locks are mechanical and meet basic mounting requirements. Following are descriptions of the 3 types shown above:

1. **TYPE F**—For flat mounting—Can be mounted on any protective device.

2. **TYPE D**—Detachable—Can be mounted on cell door, gate or compartment. One key retained with door locked open—other key can be retained by operator or used to operate other devices.

3. **TYPE B**—For base mounting—Can be mounted on handle of disconnecting device—Key released when lock is open.

Please write for Bulletin No. 1725 for full description, applications and typical schemes for R&IE Kirk Key Interlocks



TYPICAL INSTALLATION

Shown above is a typical installation of a Kirk Key Interlock System. Fuse compartment can only be opened when interrupter switch is locked open.

RAILWAY and INDUSTRIAL ENGINEERING CO., Greensburg, Pa.

IN CANADA—EASTERN POWER DEVICES LIMITED, TORONTO

AN I-T-E SUBSIDIARY

The Check List

CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS

DISCONNECTING SWITCHES INDOOR AND OUTDOOR

HORN GAP SWITCHES

INTERRUPTER SWITCHES

CUTOUTS AND THERMO-RUPTERS

DISTRIBUTION EQUIPMENT

SWITCH OPERATING MECHANISMS

SUBSTATIONS

OPEN OR ENCLOSED, ISOLATED PHASE HEAVY DUTY BUSES

KIRK INTERLOCK SYSTEMS

AUTOMATIC SWITCHING EQUIPMENT

METAL CUBICLES

TESTING DEVICES

It's no trick

TO CUT POLE REPLACEMENT COSTS WITH U·S·S CREOSOTE OIL

● There's no magic about the savings made possible by treatment with U·S·S Creosote Oil. Poles and crossarms that have been treated with this time-tested preservative last years longer . . . require far fewer replacements than untreated poles.

The adequate penetration and high toxicity that spell long life are characteristic of U·S·S Creosote Oil. And continuous processing in the world's largest tar distillation plant makes U·S·S Creosote Oil absolutely uniform in quality . . . the same good results can be obtained application after application.

If you're interested in cutting replacement costs in future years, make sure that U·S·S Creosote Oil is used in all your wood-treating operations. If you'd like additional information, contact the nearest sales office listed below; there's no obligation.

COAL CHEMICAL SALES DIVISION
UNITED STATES STEEL CORPORATION SUBSIDIARIES
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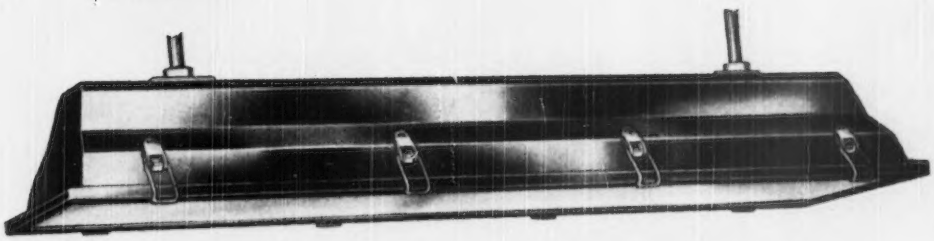
208 South La Salle St., Chicago 90, Ill. · 1509 Terminal Tower, Cleveland 13, Ohio
Brown-Marx Building, Birmingham 2, Ala. · 25 Beale St., San Francisco 5, Calif.

USS TRADE MARK

CREOSOTE OIL

UNITED STATES STEEL

HELP! ...Yourself to greater Lighting Efficiency



Wheeler GLASS-ENCLOSED FLUORESCENT FIXTURES

FOR SEVERE SERVICE CONDITIONS

DUST-TIGHT
FOR HAZARDOUS LOCATIONS

Designed for use wherever combustible dust atmospheres exist, such as those containing flour, starch, grain dusts, carbon black, coal dust, or easily ignitable fibres or flyings.

VAPOR-TIGHT
FOR NON-HAZARDOUS LOCATIONS

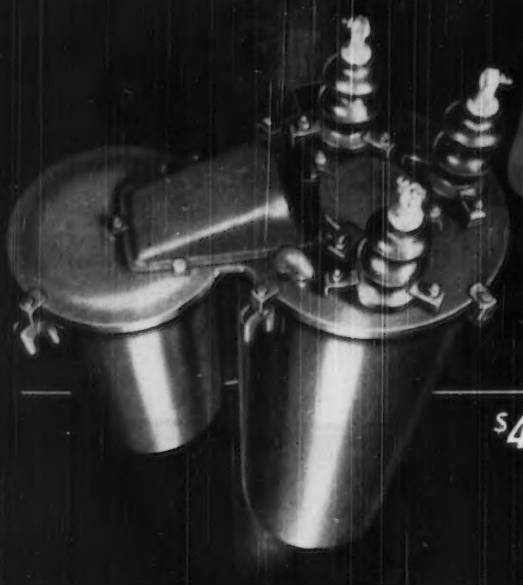
The ideal unit for use in food plants, printing establishments, and wherever non-combustible atmospheres exist. Its efficiency soundly proved in actual operation. Easily installed, economically maintained!

For complete information write Wheeler Reflector Co., 275 Congress Street, Boston 10, Massachusetts

Wheeler REFLECTORS

Distributed Exclusively Through Electrical Wholesalers

MADE BY SPECIALISTS IN "SKILLED LIGHTING" **EQUIPMENT SINCE 1881**



ALLIS-CHALMERS
POLE-TYPE
⅝% STEP REGULATOR

WHY LOSE
$400 to $1600
PER YEAR
PER FEEDER

SLASH REVENUE LOSSES

ON LINES WITH SO-CALLED ADEQUATE VOLTAGE!

OPERATORS ARE LOSING $4 to $8 per customer each year on lines with so called "adequate" voltages of 105 to 110 V. And your customer is losing too! Motor life is shortened . . . light bulb efficiency is low . . . heating is slow. Users are losing money whether they know it or not.

And operators are losing money too! Low voltage means consumption is lower than it should be . . . hence revenue is lower than it need be. It costs money not to regulate voltage.

Regulators are a common method of raising voltage and cutting revenue losses. But there's a big difference in regulators. Judge a regulator by the band width it holds.

A regulator that holds a narrow 2-volt band can maintain average voltage 1 volt higher than a regulator holding a 4-volt band. That's the band width advantage! Only Allis-Chalmers builds a pole-type step regulator that can hold a 2-volt band.

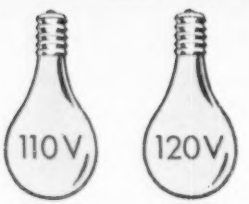
You can use the band width advantage in any of three ways:

1. You can increase revenue,
2. You can increase load carrying capacity,
3. You can extend feeder length.

Low voltage is practically a universal problem. Every day you wait to correct it you are losing money that can never be reclaimed. Call your nearby Allis-Chalmers Sales Office now for the complete story on what regulators can do for you.

ALLIS-CHALMERS, 932A SO. 70 ST.
MILWAUKEE, WIS.

"Adequate" Voltage Isn't What It Was!



Today light bulbs and most appliances are rated 115 or 120V. Users and operators both suffer when voltage is lower than this. Good voltage is good for everyone.

3189

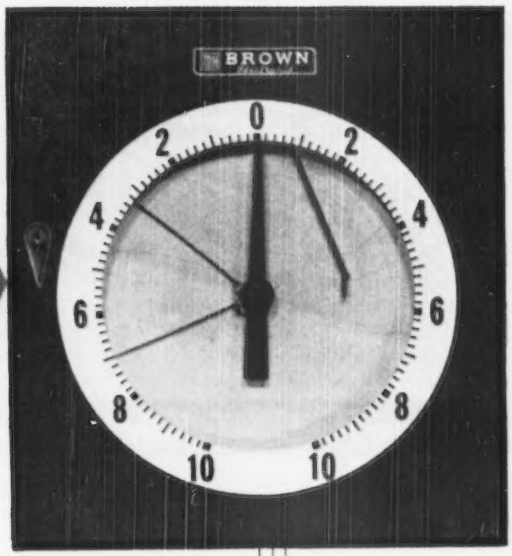
ALLIS-CHALMERS

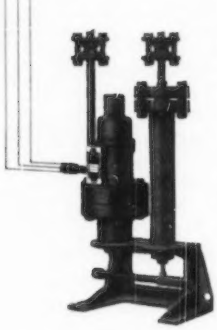
Fast Accurate Measurement of Liquid Level Changes

...WITH THE

Electronik

RECORDER





THE *ElectroniK* Liquid Level Recorder is unmatched for accuracy and speed of measurement. From the point of measurement to a centralized panel, the operator knows *instantly* . . . in split-second time . . . the *exact* change in liquid level. Accuracy is assured by the use of matched inductance bridge coils . . . sensitivity, by the inherent ability of the *ElectroniK* potentiometer to amplify the slightest current change caused by liquid level variation.

Unaffected by voltage fluctuations, accurate transmission of liquid level changes are instantly recorded at any distance up to 1000 feet . . . standard electric meter body withstands operating pressures up to 2500 psi. . . . absence of electrical contacts inside meter body reduces maintenance.

For instant, accurate measurement of liquid level . . . for easy installation, easy reading and long-life and maintenance-free service, you cannot match the *ElectroniK* Recorder. For further details, call in your local Honeywell engineer . . . he is as near as your phone!

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4568 Wayne Ave., Phila. 44, Pa. Offices in more than 80 principal cities of the United States, Canada and throughout the world.

MINNEAPOLIS

Honeywell

BROWN INSTRUMENTS

Joining Two Great Names in Engines . . .

MEANS BETTER ENGINES FOR YOU

Whether your engine requirements are best filled by a Superior or an Atlas Engine, you can be sure of the best and most practical in engineering and manufacture . . . both of these famous lines of engines are now being built by the Engine Division of The National Supply Company.

The big, modern, 15-acre Superior engine plant at Springfield, Ohio, is busy building Superior and Atlas engines. The big research and development laboratory is staffed with experts from both Superior and Atlas. And the same top-quality standards that have made each of these names outstanding in their fields will be maintained in the newly-combined operation.

Parts stocks for both brands will be developed and maintained, at additional service facilities which are being expanded to cover the continent from Alaska to Mexico, from Nova Scotia to Texas.

You can buy either an Atlas or a Superior engine with full assurance of service and spare parts . . . plus improved engineering and manufacturing techniques.

For the address of your nearest Superior-Atlas sales-service office write to . . .

THE NATIONAL SUPPLY COMPANY
ENGINE DIVISION
Plant and General Sales Office: Springfield, Ohio

DIESEL ENGINES . . . . NATURAL GAS ENGINES . . . . DUAL FUEL ENGINES

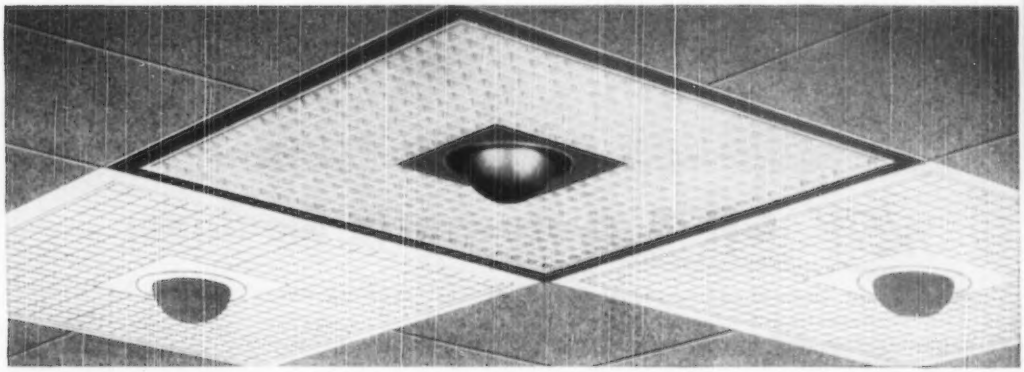
Orders for Skylike® are piling sky-high!

Silvray SKYLIKE lighting* – introduced only a couple of months ago – has excited everyone in the business: user, architect, contractor, lighting engineer. Orders and inquiries are coming in at a rate that has us jumping.

It's just our luck that STEEL has become as *hard to buy* as SKYLIKE is *easy to sell.* The Silvray Lighting purchasing department just can't find steel fast enough right now to catch up with the overnight-sensation popularity of this brilliant new concept of commercial lighting. You know the worthwhile reason, of course, so there's nothing to do but realize that Silvray SKYLIKE units will be produced – and orders will be filled – just as fast as conditions permit.

Meanwhile, for your future planning, we'll gladly send you a copy of the brochure, "Skylike Louvered Incandescent Lighting Systems". Write to *Room 1504, Graybar Electric Company, Inc., 420 Lexington Avenue, New York 17, N. Y.*

*Patent pending



Why so many businesses want Skylike

The SKYLIKE system combines the best features of silvered-bowl incandescent lighting with the architectural appeal of a fluorescent-type troffer. No other type of lighting has all its advantages! Here are some quick facts:

- Warm color—most desired by merchandising experts.
- High initial and maintained light output.
- Softly diffused shadows.
- Low brightness and 90° shielding.
- No flickering, blinking, or hum.
- Instant starting.
- Variable lamp size—150- to 500-watt.
- No light loss from darkened walls or ceilings.
- Floor-service relamping—no ladders or scaffolds.
- Hermetically sealed silver reflecting surface.
- Units fit 24" x 24" ceiling tiles, fully or partly recessed, or surface-mounted, in rows or patterns.
- Easily converted, with simple accessory, for directional or accent lighting.
- Simple in construction; simple in wiring; free of ballasts, starters, transformers.
- Lightweight; low-cost supporting construction.
- 87% reflection factor, easily maintained by occasional wiping with a damp cloth.
- Low-cost! ½ to ⅓ the cost of equipment delivering comparable results.

SILVRAY

Skylike

Distributed by GraybaR ELECTRIC COMPANY

YOU CAN BE **SURE**.. IF IT'S

Westinghouse

GR-3 Automatic Circuit Recloser in open position. 2,300 to 15,500 volts. 2,500 amperes maximum interrupting rating. 25 to 100 amperes continuous rating. 50 to 200 amperes trip rating.

NEW GR-3 Automatic Recloser

Here's a new automatic recloser for three-phase distribution systems. It's designed for dependable protection wherever fault currents are within its rating, and is especially applicable in remote substations, on rural three-phase distribution lines, and in control of three-phase apparatus such as motors on irrigation pumps.

This new addition to the line of GR Reclosers is built to give time-tested GR Recloser low-cost operation. It's actually three single-pole GR Recloser units, suspended from a single top casting and immersed in a common tank of oil. Each pole operates independently until it reaches the lock-out position, at which time it trips the other poles. All three poles close simultaneously when operated by the manual reset lever.

Call your nearby Westinghouse representative for complete information, or write for DB 33-758, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-60742

CHECK THESE FEATURES

- Choice of trippings—one instantaneous and 3 time delay, or 4 time delay.
- Enclosed "self-driven" oil orifice type "De-ion"® interrupter.
- A single tank, for quicker, easier maintenance and inspection with no sacrifice in dependability.
- Full 15-kv insulation.
- Single-pole reclosing with 3-pole lock-out.
- Provision for pole mounting with three optional mounting arrangements.
- Simplicity of design—interchangeable series coils.
- Bushings, coils and contact details interchangeable with single-pole 100-GR Reclosers.

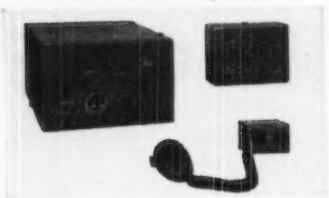
Westinghouse

GR RECLOSERS

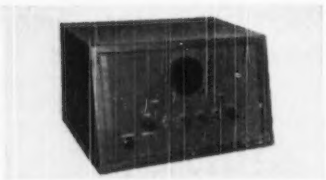
After unbiased comparative tests –

the STATE of FLORIDA *goes RCA!*

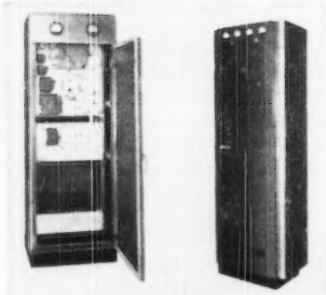
Florida uses the complete RCA Fleetfone System



• Mobile Fleetfone 30 watts



• Station Control



• Station Fleetfone 70 watts

• Station Fleetfone 250 watts

RCA 2-way Fleetfone radio chosen after tests by the University of Florida Laboratories

WHEN THE Florida State Highway Patrol prepared to expand its 2-way radio system to cover the entire state, competitive bids were invited and manufacturers were asked to submit equipment for tests.

The University of Florida Laboratories submitted these equipments to a series of gruelling tests to determine reliable car-to-car communication distance, adjacent-channel interference, and maximum headquarters-to-mobile range.

Result: Florida has ordered RCA Fleetfone 100%!

. . . .

Plan your communications system around *laboratory-approved* equipment. Go RCA. The RCA Fleetfone (for 30 to 50 mc operation) and its companion, the RCA Carfone (for 152 to 174 mc operation) offer the finest in mobile communications.

For information and help on any type of two-way radio system, call or write Dept. 31-J. RCA Engineering Products, Camden, N. J.

MOBILE COMMUNICATIONS SECTION
RADIO CORPORATION of AMERICA
ENGINEERING PRODUCTS DEPARTMENT, CAMDEN, N.J.

In Canada: RCA VICTOR Company Limited, Montreal

Get a better day's work out of your Truck Dollar

CHEVROLET TRUCKS

CHEVROLET

You invest money in a truck to *get work done.* And you can prove to your own satisfaction that a Chevrolet truck does more work for every dollar you put into it.

You get *more for your money* right from the start, because your Chevrolet truck is priced at rock bottom. Chevrolet volume production—far and away the biggest in the truck field—makes possible extra features and extra engineering advantages at lowest cost.

You get *more for your money* every driving mile, because Chevrolet trucks are economical to operate. The top-rated efficiency of Chevrolet Valve-in-Head engine design saves money on gas and oil day in, day out.

You get *more for your money* right through the years, because your Chevrolet truck cuts upkeep to the bone. Hypoid rear axles, diaphragm spring clutch, ball-type steering and many other great truck features help keep your truck on the job and out of the shop.

Get the full "more-work-per-dollar" story from your Chevrolet dealer—and get America's biggest selling, best performing truck: Chevrolet.

CHEVROLET MOTOR DIVISION, *General Motors Corporation*
DETROIT 2, MICHIGAN

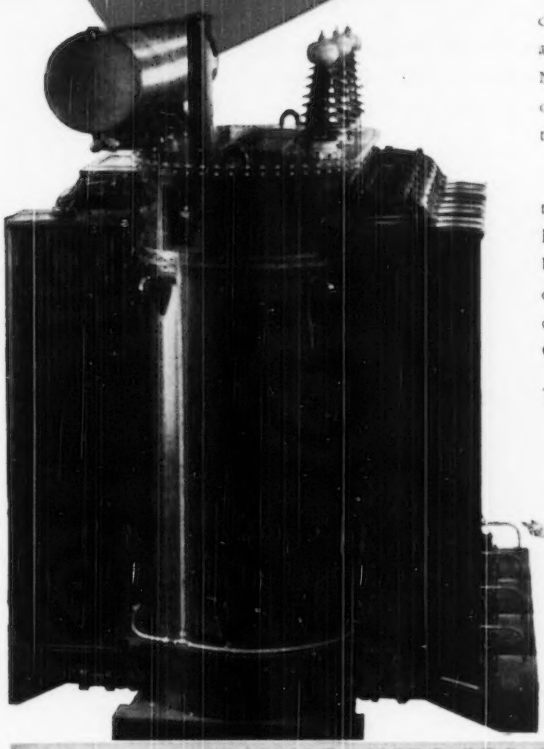
These Great Features Help Tell Why
CHEVROLET TRUCKS
ARE THE FIRST CHOICE OF
TRUCK BUYERS EVERYWHERE

TWO GREAT VALVE-IN-HEAD ENGINES: the new Loadmaster and the improved Thriftmaster—to give you greater power per gallon, lower cost per load • THE NEW POWER-JET CARBURETOR: smoother, quicker acceleration response • DIAPHRAGM SPRING CLUTCH for easy-action engagement • SYNCHRO-MESH TRANSMISSIONS for fast, smooth shifting • HYPOID REAR AXLES—5 times more durable than spiral bevel type • DOUBLE-ARTICULATED BRAKES—for complete driver control • WIDE-BASE WHEELS for increased tire mileage • ADVANCE-DESIGN STYLING with the "Cab that Breathes" • BALL-TYPE STEERING for easier handling • UNIT-DESIGN BODIES—precision built.

Standard

TRADE MARK ®

The Seal of Transformer Dependability

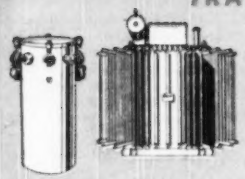


Your transformer needs are specifically met by STANDARD, because our facilities are exclusively devoted to transformer design and manufacture. Difficult assignments have been our meat. We design and build to your specific needs, and all designs meet NEMA and EEI standards. Use STANDARD'S quarter of a century of experience to make your installations adequate, safe and dependable.

Pictured here is a 10,000 KVA three phase power transformer designed for a specific application. Forced air cooling for 25% load increase is supplied. Used for step-up from 13,200 to 69,000 volts. Discuss YOUR transformer requirements, whether large or small, with the nearby Standard Transformer Company representative.

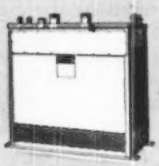
THE STANDARD TRANSFORMER COMPANY
WARREN, OHIO
Representatives in Principal Cities

TRANSFORMERS FOR EVERY APPLICATION

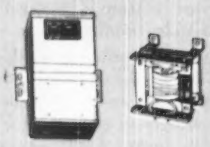


Liquid filled (sizes up to 10,000 KVA and 72 KV inc.)

Instrument transformers (for use on circuits up to 72,000 volts, inc.)



Dry type (up to 1000 KVA and max. voltage ratings of 4800)



Control transformers (compound filled or open type)

"Trouble comes with bad weather...but bad weather doesn't slow us up ...thanks to FWD's"

"Our teamwork improved . . . we picked an FWD matched combination of truck and equipment to fit our job"

"Our FWDs last longer because there's less strain . . . both load and power are properly distributed"

"Now we restore service faster . . . with FWD's"

Today's trend to FWD is due to this growing realization:

A utility's all-season performance on maintenance and construction is materially influenced by the *type of vehicle* employed!

It is common knowledge that no other truck can equal FWD when challenged by mud, sand, snow, ice, grades and off-the-road work. But, utilities discover additional dollar-advantages in also using FWD for normal, routine service. These *overall* FWD superiorities are significant assets throughout the economics and public relations of a utility.

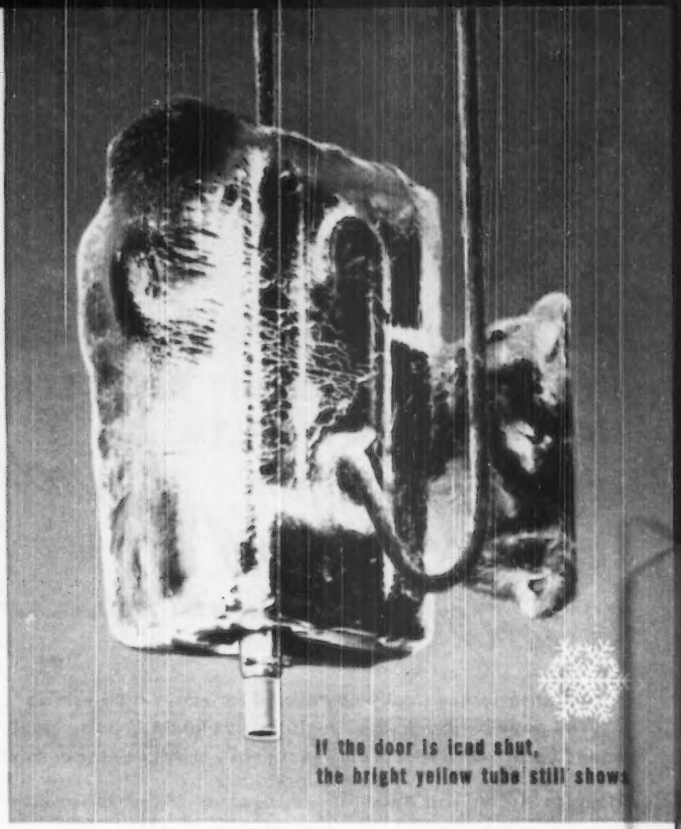
GET FULL FACTS on 38 standardized FWD motorized units. Each combines truck and equipment into one complete, easy-to-buy package — matched to your particular needs. One central responsibility for all equipment. See Graybar or write FWD direct.

THE FOUR WHEEL DRIVE AUTO CO.
Clintonville, Wisconsin • Canadian Factory: Kitchener, Ont.
World-Wide Sales and Service

Distributed by GRAYBAR

America's Foremost Heavy-Duty Truck

When it blows, the door drops



If the door is iced shut, the bright yellow tube still shows

You get *Dual Indication*

with L-M's PVD 561 the all-weather cutout

In summer or winter, sunshine or sleet, you can count on the DUAL INDICATION of the PVD 561. When the fuse blows, the flip-out device rapidly withdraws and ejects the blown link. Upper contact spring pushes the tube down, releasing the door, which is then forced out by pressure of the lower contact spring. Works like a charm!

If the door should be iced shut, the tube still drops. Its bright yellow plastic is a vivid indication to the lineman that he'd better do something about it.

Operation assures positive disconnect—there are no live parts on the door, which is easily unhooked for re-fusing. High-grade wet-process porcelain housing. Heavy copper contacts with silver-plated surfaces. Positive contacts and substantial current-carrying parts assure low operating temperatures. Non-ferrous parts eliminate danger of corrosion. Instant, smooth operation.

Two ratings: PVD-561, 5000 V, 50 amps; PVD-761, 7500 V, 50 amps. Both have rated interrupting capacities of 1200 amps. Door and cartridge assemblies interchangeable with the PVD-56 and 76. By carrying a spare fused door the lineman can re-fuse either type in 60 seconds or less.

Easy Way to Get Details

Ask the L-M Field Engineer for Bulletin FC2 or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

LINE MATERIAL Fuse Cutouts and Fuse Links

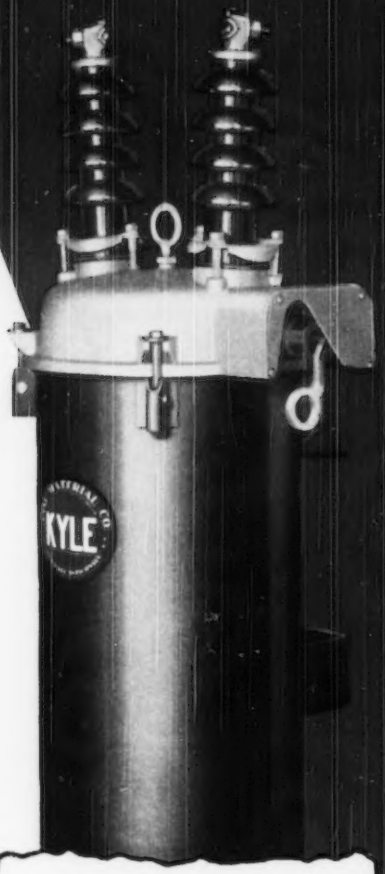
Complete Coordinated Equipment for Distribution Today

KYLE

TYPE "L" OIL CIRCUIT RECLOSER NOW GIVES YOU UP TO

6000 amps interrupting capacity

IN NEW 140-AMP RATING



First recloser actually engineered for heavy-duty service . . . full power-class design . . . 110 kv insulation impulse level . . . ratings up to 140 amps . . . only real heavy-duty recloser in its class

Kyle type "L" reclosers cost a little more than lighter-duty reclosers, but they're worth the difference in service, performance, convenience, and freedom from maintenance. Even if you don't need the extra interrupting capacity now, you will need it to take care of future loads; and in the meantime you enjoy all the benefits of type "L" performance and economy.

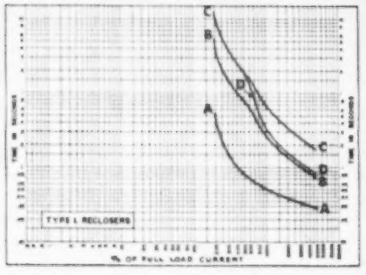
It's the Kyle oil cross-blast method of arc extinguishing, plus heavy-duty design, that makes it possible for the "L" to handle heavy fault currents up to 6000 amps.

The type "L" is the only recloser with so wide a choice of operating sequences. Four standard curves permit any sequence of operation to meet your coordination problems.

Sequence and coil changes are made right in the field—in a few minutes. To change to a coil of different rating, you just remove two screws. To change operating sequence, simply rotate a disc or change one small part. It's quick—and easy! Saves shop trips!

Extremely accurate; virtually no effect from ambient temperature changes. Positive fast operation; positive toggle closing—doesn't depend on gravity. Many safety features: cover and tank electrically dead—bushing tops only live parts; trip-free operating handle. Large sleet hood protects counter and operating handle; may be rotated in 90° steps. Rugged; shock-proof; trouble-free.

ONLY RECLOSER WITH 4 OPERATING CURVES



RATINGS

Coil Rating Amperes	Min. Trip Current Amperes	Maximum Interrupting Capacity Amperes At Maximum Phase-to-Phase Nominal Voltage of		
		4.8 kv	7.2 kv	14.4 kv
25	50	1500	1500	1500
35	70	2100	2100	2100
50	100	3000	3000	3000
70	140	4200	4000	3000
100	200	5000	4000	3000
140	280	6000	4000	3000

Read all about it!

Ask the L-M Field Engineer for a copy of Bulletin CR1A—on the type "L"; or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

18

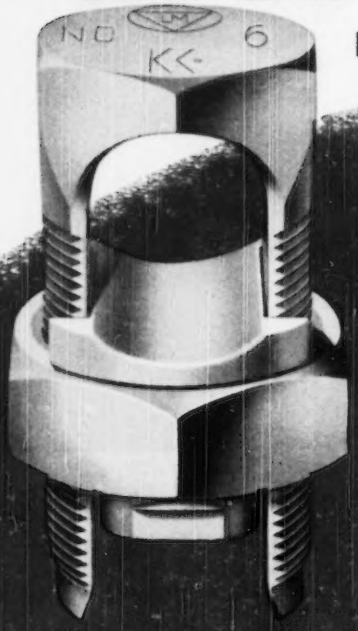
LINE MATERIAL...Kyle Reclosers

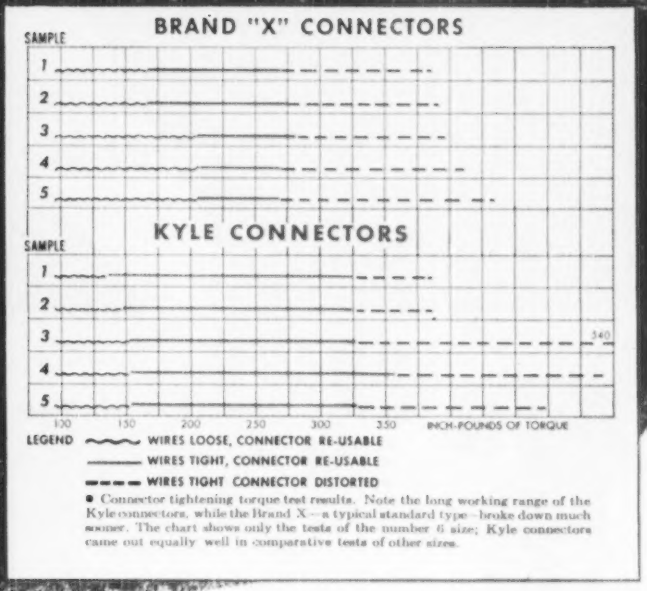
Complete Coordinated Equipment for Distribution Today

TORQUE TESTS SHOW

KYLE Split-Bolt Connectors

HAVE A LONGER WORKING RANGE





● Connector tightening torque test results. Note the long working range of the Kyle connectors, while the Brand X—a typical standard type—broke down much sooner. The chart shows only the tests of the number 6 size; Kyle connectors came out equally well in comparative tests of other sizes.

For our own information, we put the squeeze on a bunch of connectors—with a torque wrench. The test chart shows the results.

Note the *long* working range of the KYLE connectors, and the much *shorter* range of Brand X—a typical, standard-quality connector that looks about like ours. That's valuable information for *any* connector purchaser.

HERE'S WHAT HAPPENS . . . *Some* connectors—but not KYLES—have rough threads. That means extra torque to turn the nut, extra strain on the connector body. Often the pad fits badly and goes a little skew-gee, requiring still more torque. Something has to give—the connector body takes the beating.

But heavy-bodied KYLE connectors have clean, accurately machined threads, smoothly rounded edges, a close-fitting pad. The nut tightens easily, the pad slides up smoothly, the force is on the wire—and the connector comes up without damage while still holding the wire much tighter.

COSTS LESS TO USE . . . A connector that can be used only once is an expensive connector. A connector that can be re-used is more economical. KYLE connectors work better, last longer, and, as the chart above shows, they'll stand lots more torque and still come up ready for re-use. That makes it obvious that you get better connections, and lower costs, when you get KYLES, the long-range, long-life connectors.

● If you want to save money with quality connectors, ask the L-M Field Engineer for samples and a copy of Bulletin SC1 which gives details. Or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

TIGHTENING TORQUES FOR SPLIT-BOLT CONNECTORS RECOMMENDED FOR BEST RESULTS

Connector size	Inch-pounds
8	75
6	225
4	275
2	350
2 stranded	400
1/0	500
2/0	600
4/0	750

2-R

LM

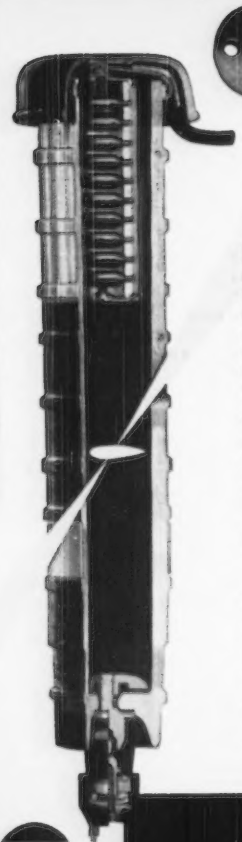
LINE MATERIAL Kyle Connectors

Complete Connector Equipment for Distribution Today

PROTECTION TODAY

LENS

for a lightning arrester



Here is how L-M Valve Type Arresters counteract "skin effect," and why L-M's "Granulon" characteristic element has such high discharge capacity and unchanging characteristics.

Lightning follows the path of least resistance—electrically. Also, like 60-cycle current in a conductor, it tends to "skin" down the outside of the valve element. In a lightning arrester, when the resistances down the middle and side of the valve element are the same, the surge invariably tends to channel down the outer edges.

The result? Repeated surges lower the discharge capacity, and in time the arrester clinkers, and fails. Usually nobody knows why, and attributes the failure to a direct stroke.

In L-M's "Granulon" characteristic element, *lens-shaped metallic electrodes* shorten the electrical distance down the center just enough to counteract the skin effect. The surge discharges evenly all through the "Granulon"—and the arrester lasts far longer.

The arrester can take *more* heavy surges . . . it maintains its high discharge capacity without change for years and years . . . rate of failure is gratifyingly low.

(Incidentally, that is why L-M is the only manufacturer who *dares* to put his arrester into a Pyrex® glass housing. You can *see* any signs of failure—which is so rare in L-M arresters we don't mind taking the cat out of the bag!)

Other features: precision gap, maintains low sparkover and fast action on both long low and steep front waves . . . draws negligible follow current—permits accurate fuse coordination . . . The Isolator, L-M's patent insurance feature—the arrester can never ground feeders. In all distribution voltages . . . Meets NEMA Standards and more!

GET THIS BOOKLET—JUDGE FOR YOURSELF

Ask the L-M Field Engineer for a copy of Bulletin LA1, or write Line Material Company, Milwaukee 1, Wisconsin (A McGraw Electric Company Division)

7488

LINE MATERIAL Lightning Arresters

Complete Coordinated Equipment for Distribution Today

YOU WOULDN'T PAINT A SAFETY PIN!

It's Stainless Steel!

Today people like Oakville Company Division of Scovill Mfg. Co. are making doubly sure that the diaper set won't get rust in its pants, by making safety pins of stainless steel!

THEY DON'T PAINT THESE STREAMLINERS!

Stainless steel trains, like this one by Budd, never need painting. Stainless steel just doesn't rust, doesn't corrode, doesn't do anything but go on and on. Photo shows one of the Burlington's Denver Zephyrs which, after 13 years service, recently came in for their first major overhaul. They needed only polishing to make them shine like new again.

They're Stainless Steel!

and you don't have to paint CAPACITORS, either ... WHEN YOU GET

L-M ELEMEX CAPACITORS IN STAINLESS STEEL TANKS

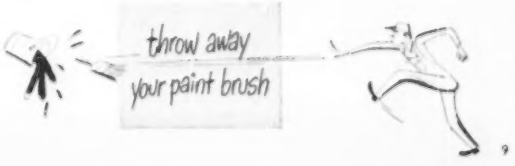
Throw away your paint brush—the war against rust is over—so far as power capacitors are concerned. Of course, the payoff is to get ELEMEX capacitors that come in stainless steel tanks that never need painting. ELEMEX capacitors have been on the market for six years, and for the last two in stainless steel tanks, "Hydis"-treated for high heat dissipation. They've got a marvelous performance record.

Lots of other features and advantages: low unit stress makes ELEMEX capacitors last and last . . . L-M "Lifetime" solder-sealed bushings assure positive hermetic seal . . . "Paragroove" connectors make the hook-up so simple; you don't need to cross leads, or lose a lot of time when you replace with larger size ELEMEX capacitors.

Made by L-M's unique and highly effective continuous method of individual evacuation, drying, and impregnation with ELEMEX dielectric liquid, with constant testing during the process. Nothing like it!

Want even more? Well, there's lots more to tell—details, other features. Ask the L-M Field Engineer for copy of our ELEMEX Bulletin or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

ANOTHER PRICE REDUCTION, TOO!



LM

LINE MATERIAL . . . Capacitors

Complete Coordinated Equipment for Distribution Today

NEW UTILITY STATIONS C-E EQUIPPED

Includes stations placed in operation since the war (in white) and those under construction or being engineered.

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CECIL LYNCH
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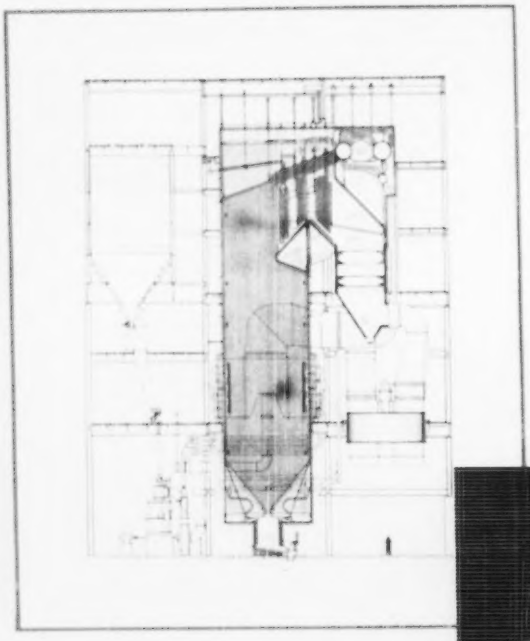
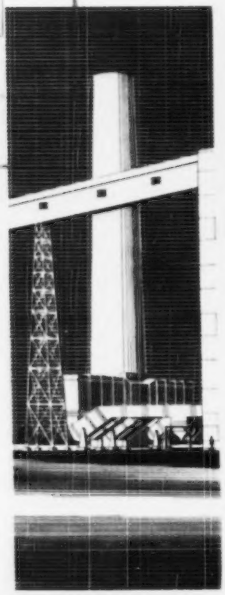
PORT JEFFERSON
CUTLER
WHITE RIVER
GADSDEN
POTOMAC RIVER
W. SPRINGFIELD
WOOD RIVER
LAKE CATHERINE
HARRY NEWMAN
DAN RIVER
JIM HILL
HUTCHINSON

YATES

DUNKIRK
TITUS
CONTRA COSTA
HAWTHORN
LEE
EDGE MOOR
PALATKA
NINEMILE POINT
BLACK DOG
CLERMONT
MERAMEC
DANSKAMMER
ALBANY

NEW





The cross-sectional view above shows one of the two duplicate C-E Units which comprise the first section of Plant Yates. They are 3-drum units of the radiant type with 3-stage superheaters and have finned tube economizer surface in the last pass. Regenerative type air heaters follow the economizer surface. These boilers are designed for pulverized coal firing using bowl mills and tilting, tangential burners; natural gas will also be used, as an alternate fuel, or in combination. Steam is produced at 1325 psi and 950 F at the superheater outlet.

COMBUSTION ENGINEERING

ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS

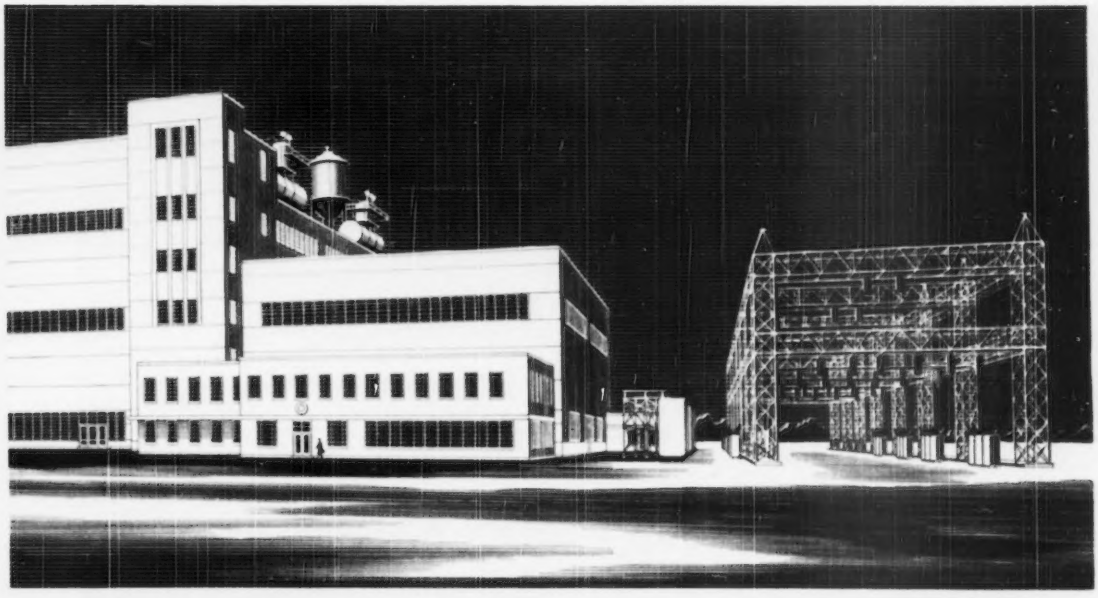
Plant Yates goes into service

Georgia's power demand continues to grow but so, fortunately, does its power producing facilities. With foresight characteristic of the country's public utility companies, the Georgia Power Company is ready to meet increasing power requirements with its new Plant Yates Station, the first unit of which was placed in service in September.

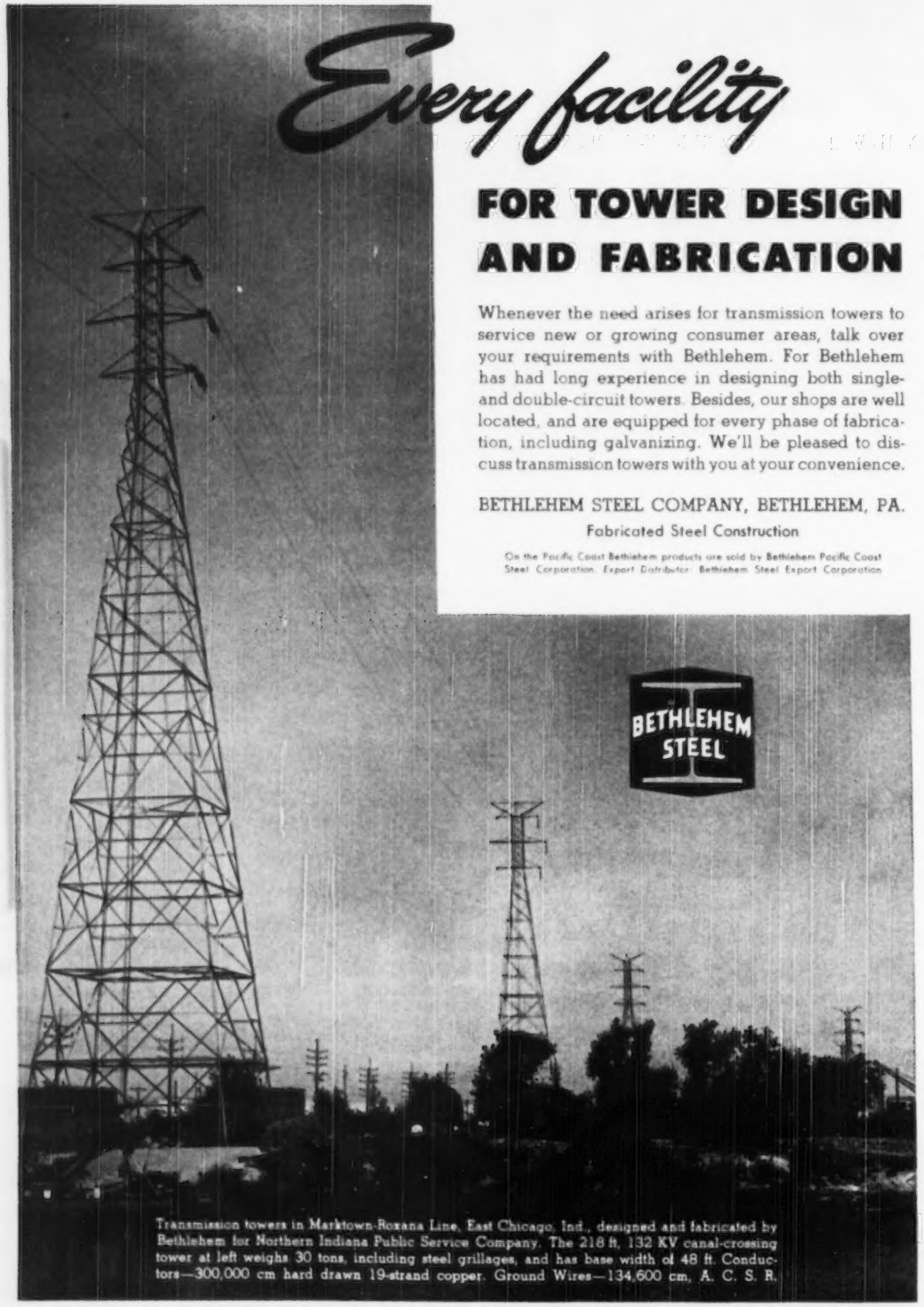
Located at Whitesburg on the Chattahoocee River this fine modern plant now has its first 100,000 kw turbine-generator in service. A second unit of equal capacity is under construction and is expected to be ready for service by the end of this year. Ultimately four such units are planned bringing the station's capacity to 400,000 kw. Plant Yates was designed and engineered by Southern Services, Inc. of Birmingham.

Each of the two 100,000 kw units which comprise the first section of the plant is served by a single C-E Steam Generator in the widely favored one boiler, one turbine arrangement.

A cross-sectional elevation of one of the new Yates steam generators with a brief description thereof is shown on the opposite page. B-435



— SUPERHEATER, INC.
200 MADISON AVENUE, NEW YORK 16, N. Y.
C-E



Every facility

FOR TOWER DESIGN AND FABRICATION

Whenever the need arises for transmission towers to service new or growing consumer areas, talk over your requirements with Bethlehem. For Bethlehem has had long experience in designing both single- and double-circuit towers. Besides, our shops are well located, and are equipped for every phase of fabrication, including galvanizing. We'll be pleased to discuss transmission towers with you at your convenience.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

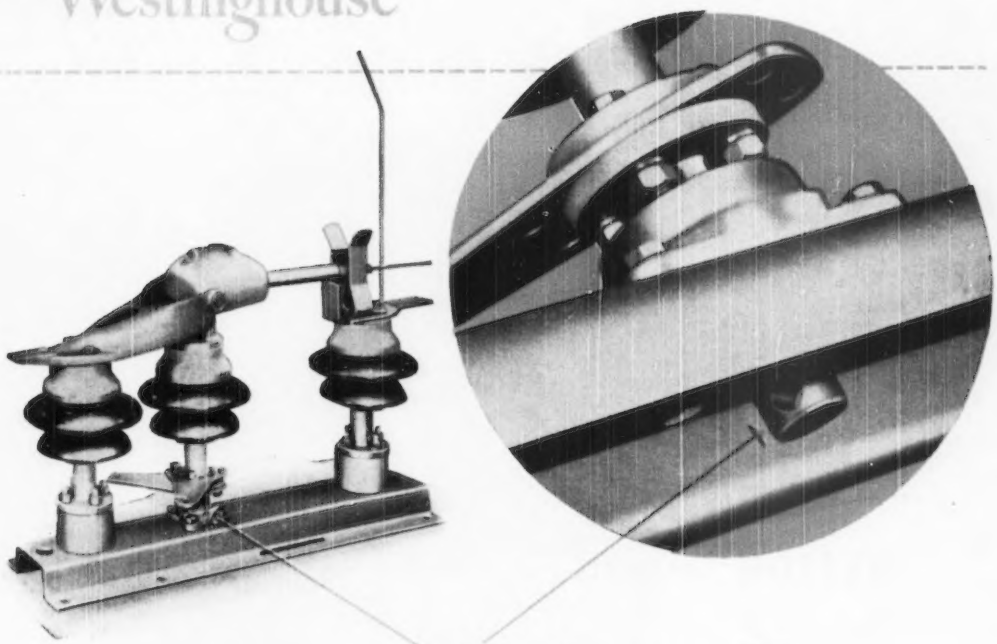
Fabricated Steel Construction

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

Transmission towers in Markham-Roxana Line, East Chicago, Ind., designed and fabricated by Bethlehem for Northern Indiana Public Service Company. The 218 ft, 132 KV canal-crossing tower at left weighs 30 tons, including steel grillages, and has base width of 48 ft. Conductors—300,000 cm hard drawn 19-strand copper. Ground Wires—134,600 cm, A. C. S. R.

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



a small detail

BUT... IT ELIMINATES A LARGE INSTALLATION PROBLEM

On any Westinghouse Type V Disconnecting switch, the rotating insulator bearing shaft does *not* extend below the base. Store 'em, install 'em—faster and easier. All switches have a flat mounting surface, free of any extensions that might get in the way of structure lacing, or make storage and handling a headache. This *minor* detail becomes a *major* factor in saving time and simplifying installation.

Count up these "little things" that make the *big* difference in switch value.

. . . Only 3 moving parts
. . . Completely enclosed hinge-end mechanism and contacts
. . . Long-life rigid contact for bridging hinge
. . . Simple one-piece break jaw
. . . Bearings lubricated for life
. . . Simple, bent steel base—flat mounting surface

Want more information? Get in touch with your nearby Westinghouse office or distributor. Ask for B-4241. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60700

Westinghouse

TYPE V

DISCONNECTING SWITCHES

NO OTHER TESTER

does so much...so well!

WESTON
Model 785
INDUSTRIAL CIRCUIT TESTER

In the shop . . . 28 ranges *in one case* to locate circuit troubles on production equipment. *On the bench* . . . 28 ranges *in one case* for checking electrical equipment during manufacture. *In the lab* . . . 28 ranges *in one case* immediately available for research and development work.

28 Instrument Ranges

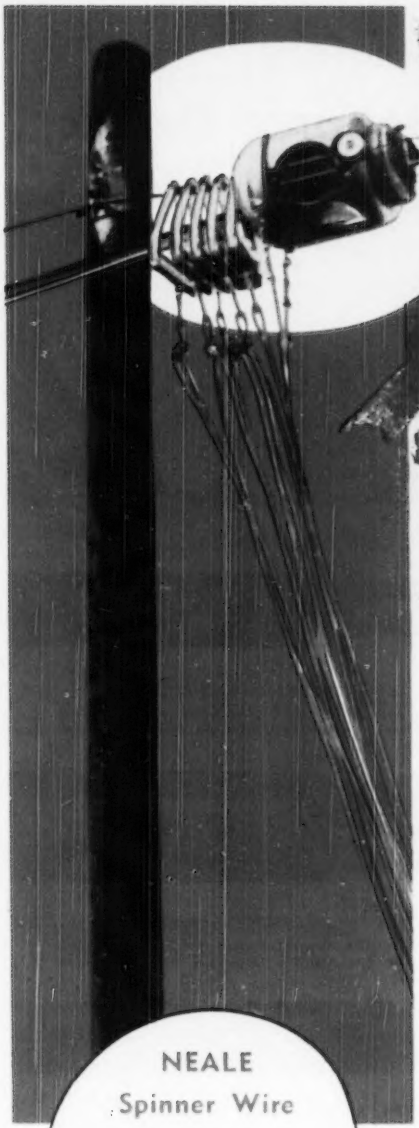
D-C VOLTS: 100 mv, 1/10/50/200/500/1000 volts (20,000 ohms per volt).
A-C VOLTS: 5/15/30/150/300/750 volts.
D-C CURRENT: 50 microamps, 1/10/100 milliamps, 1/10 amps.
A-C CURRENT: 5/1/5/10 amps.
RESISTANCE: 3000/30,000/300,000 ohms, 3/30 megohms.

Stock Accessories Available for Extending Above Ranges

It does so much, so well, for so little. Check your Weston Representative for full details or see your local jobber. Weston Electrical Instrument Corporation, 578 Frelinghuysen Avenue, Newark 5, New Jersey . . . manufacturers of Weston and Tagliabue Instruments.

WESTON *Instruments*

Albany • Atlanta • Boston • Buffalo • Charlotte • Chicago • Cincinnati • Cleveland • Dallas • Denver • Detroit • Houston • Jacksonville • Knoxville • Little Rock • Los Angeles • Meriden • Minneapolis • Newark • New Orleans
New York • Orlando • Philadelphia • Phoenix • Pittsburgh • Rochester • San Francisco • Seattle • St. Louis • Syracuse • Tulsa • Washington, D. C. • In Canada, Northern Electric Company, Ltd., Powerlite Devices, Ltd.



Cable Spinning in Field with NEALE Model "K" Proves 5 Ways Better!

1. One-Third LOWER INSTALLATION COST than with pre-assembled cables.

2. SAVES SPACE over open-wire construction in congested areas.

3. Provides EXTRA PROTECTION against storm damage.

4. Light weight single conductor cables can be handled in 300% GREATER LENGTHS than heavy pre-assembled cable. Reduces number of splices and installation labor costs.

5. REDUCES CABLE INVENTORY, as 1/c, 2/c or 3/c cables may be made up in the field as required. Invaluable in emergencies.

NEALE

Spinner Wire

Available in seven different types and sizes. Famous NEALE Spinning Wires meet the toughest construction and corrosion conditions.

NEALE MODEL "K" SPINNER spins a single cable, or three 2" cables into a compact triangular pattern. Apex of triangle points down. Strand lies in groove formed by two top cables.

Drum rotated by two friction drive wheels which are rotated by wire being pulled from drum. Regardless of condition of strand, drum revolves once when 13" of wire is pulled. Drum carries two spools of spinning wire spaced to spiral 6½ inches apart for ample cable support.

Magnesium castings used wherever possible for lightness and strength. Weight approx. 36 lbs. Length 18½", 12" diameter, 4¾" exit.

CABLE SPINNING EQUIPMENT CO.

TOPEKA, KANSAS Phone 3-1829

For a SURE APPROACH to safety depend on National Electric

Approved under specification L-824

These National Electric Style RR Flexlay Cables are CAA approved. After rigorous tests, they are now included on the "List of Approved Lighting Equipment" as covered by Civil Aeronautics Authority Specification L-824 "Underground Electrical Cables for Airport Lighting Circuits."

NE Flexlay Cables are *dependable* for the continuous service conditions required by airports. With plenty of built-in "abuse resistance," they are ideally suited for underground installation—either direct burial in the earth or pulled in conduits.

National Electric CAA-approved cables are recommended for airport lighting and signal circuits, as well as for street and highway lighting, municipal, power and other installations where *maximum dependability* is desired for underground wiring. The tough, specially-compounded Neoprene sheath affords complete protection against the destructive forces below the earth's surface, and gives outstanding protection when exposed to the sun and weather.

Specify National Electric CAA-approved cables for safe, reliable operations in your next airport installation.

TYPE "A" PERFORMANCE CABLE

Flexlay, Style RR, Airport Lighting Cable, 600 Volt Rating, AWG Sizes 4 through 16. (Single and Multiple conductor available)

TYPE "B" OZONE RESISTANT CABLE

Flexlay, Style RR, Airport Lighting Cable, 3000 Volt Rating, AWG Sizes 4 through 10. (Single and Multiple conductor available)

TYPE "B" OZONE RESISTANT CABLE

Flexlay, Style RR, Airport Lighting Cable, 5000 Volt Rating, AWG Sizes 4 through 8. (Single Conductor)

Light in weight—Flexible
Easy to handle

National Electric
PRODUCTS CORPORATION

1305 CHAMBER OF COMMERCE BUILDING, PITTSBURGH 19, PA.

Is There A Limit?

THE RECENT ACTIVITIES of the super co-ops and the SPA in Missouri cause one to ask the question, "Is there any limit to the potential expansion of federal power agencies?" And for the super co-ops alone one might ask, "Is there any limit to their power to cover the U. S. with transmission lines and duplicating power facilities?"

If such deals as those between the super co-ops in Missouri and the SPA are in the public interest, according to law, required for power needs of the area and approved by Congress, then no one would object to their consummation. Certainly the American public has a right to decide who shall provide their power supply. But in the present instance there is considerable doubt as to the legality and the public backing of the federal power expansion program in Missouri. We might also ask whether the electric co-ops are really behind this kind of scheme or whether they are mere tools in the hands of socialist planners.

SPA has failed in previous attempts to obtain Congressional approval to build its own steam generating plants and transmission lines. So some other device had to be found for expanding this system. Now under the SPA-super co-op plan the N. W. Electric Power Cooperative, Inc and the Central Electric Power Cooperative along with the Sho-Me Power Corp are receiving REA loans for the purpose of building steam generating plants and transmission lines. When these power supply facilities are completed, the lines will be leased to the SPA and the entire output of the generating plants will be sold to SPA for a period of 40 years.

It seems entirely appropriate that the electric utilities serving the State of Missouri should bring suitable actions in court to test the legality of this activity. The plaintiffs include Union Electric Co of Missouri, St. Joseph Light & Power Co, Missouri Power & Light Co, Kansas City Power & Light Co, Missouri Public Service Co, Missouri Gas & Electric Service Co, Missouri Utilities Co. The Empire District Electric Co, Missouri Edison Co, and Arkansas-Missouri Power Co.

The complaint alleges that the plan violates the REA Act of 1936 and the Flood Control Act of 1944 under which SPA was established. The companies ask the court for an injunction against the carrying out of the SPA-super co-op deal.

As their solution to the problem, the complainants state that "All of the electric energy which (the dams) are capable of producing can be sold to privately owned utilities at rates which would comply with statutory commands, would yield to federal taxpayers the full economic value of said energy, would reduce the burden upon federal taxpayers, would contribute to the greatest possible extent to the power supply in the southwestern power area, and would spread the benefits of said electric service most widely among citizens and taxpayers of the nation."

We subscribe to this solution.

Get Out the Vote

MORE ELECTIONS are won by people who do not vote than by pluralities in the ballot boxes. "Won" is the word, not "lost." It is the right word because every vote not cast by a supporter of a candidate or issue is a vote for the opposition. Thus it is that many, too many, citizens help to elect candidates of whom they do not approve. This is the way that organized radical minorities often take over control of labor unions. They do the same in local, state, and national elections, counting on apathy and just plain laziness as a fifth column working for them among the opposition.

No group should appreciate this dismal truth more than the power companies. More and more definitely the lack of preponderant hostility to them is disclosed by soundings of public opinion. Yet, their political enemies continue to win elections. The reason is that too many of the people friendly to them do not take the trouble to vote.

Every reasonable person will concede that if it is the will of a majority of the people that government should put the power companies out of business, then the companies should accept the decision with good grace. But if this is the will of only a minority, then it should not be accomplished. This is the American way. In order that it be followed, many power companies are now exhorting their employees to vote and to persuade their families and friends to vote. They are telling them to vote, not for whom or what to vote. All power companies should be doing this now, in full confidence that if the coming election expresses the will of the majority of all the people, not just the will of a majority of a comparative few who vote, their position will be secure.

Where to Re-Invest?

WHEN Puget Sound Power & Light Co is finally sold out to the various "public power" agencies that have been gnawing at it for so long, the owners of its securities will be paid off. How much they will get is of no importance here, however important it is to them. What we want to talk about is not how much they will get but what they will do with it.

First, of course, government will take all it can in taxes. The remainder will be at the disposal of the owners to do with as they will. That's not quite right; the sentence should end, "to do with as they can." They can spend the money in riotous living. They can save it the way squirrels save, put it away in a sock and let inflation eat it up. Or they can re-invest it.

Here is where they will encounter what they can't do. They can re-invest the money in the electric utility business but not with any such hope of return or appreciation of value as once made PSP&L securities attractive. This is not because the business lacks potentiality of growth. There is no limit to that. It is not because the business is poorly managed or inefficiently operated. The record denies any such charge. It is not because the people are not willing to pay a fair price for electric service. Millions of satisfied customers say this is not so. The blame for the condition lies at the door of government. In large areas of the country, government has forced power companies out of business as it is doing now with Puget. In other areas government threatens their existence. Over the whole industry the government frown impends.

Thus the money paid to owners of PSP&L securities will find fewer and less attractive opportunities for re-investment in the electric utility business than were offered in the past. For this limitation and deterioration of opportunity, for this outright disservice to its citizens, government must accept the responsibility.

The American Storygraph

WE FORGET so much, all of us. In the concern of daily living, in meeting the problems that crowd upon us, in the confusion and uncertainties of our times, in the fears and frustrations that world conditions visit on us, we forget that ours, among all the nations, is still the one most blessed with freedom and freedom's gifts. We forget more than this; we forget the ideal that gave it to us.

There is an answer, a conclusive and comprehensive answer, to all the fretful faultfinding which is the stock in trade of those who would shatter our world into bits before moulding it into their heart's desire. The answer lies in what so easily we forget. We need a reminder. No, that is wrong, we need continual reminding so that at no time, even when most inclined to discontent, will we forget what has made our country the envied of the earth.

What we need reminding of is just plain Americanism. The essence of this is that the individual is free to make his own way according to his abilities and ambitions. A good example of this reminding is the life story of Eddie Rickenbacker which is scheduled for publication in the *American Magazine* for November. The story is dramatized in "comic" strip form, simply and forcefully. We suggest that power company executives watch for it, consider its fitness for spreading the idea they want accepted by the people, and then use it for that purpose.

The Television Load

MAYBE the electric utilities will have to take another look at television as a load builder. It will be a long time before color TV puts black and white out of business, if it ever does. But certainly the recent FCC decision on color will make a lot of people hesitate about buying sets and load probably will not grow as fast as the rapidly mounting sales of the past few years have indicated. Also, as color sets come into use, the now accepted figures of energy consumption will undoubtedly have to be revised.

The Electrical Week

IN WASHINGTON—On the eve of the first meeting of his industry advisory council MEA Administrator Chapman announced its membership. Of the 30 men named 21 are officials of privately owned companies (p 82) . . . The Rural Electrification Administration has announced that central station service has reached 5,053,676 farms, 86.3% of those in the nation (p 83) . . . The District of Columbia has gotten into step with the rest of the nation. A law has been passed requiring the registration of professional engineers (p 85) . . . Disregarding Congress, President Truman has ordered six federal agencies to make a comprehensive survey of the resources of New England and New York (p 86) . . . The Atomic Energy Commission promises industry more technological information and has hired Norman Jacobson, Allis-Chalmers, to carry out this program (p 87) . . . The electric and gas industries have gotten together to ask Congress for equitable treatment in the excess profits tax legislation (p 88) . . . And from now on NLRB will use the Taft-Hartley Act in ruling on practically all cases involving electric utilities (p 89).

ELSEWHERE—Two makers of television sets have gone to court to upset FCC's ruling favoring CBS color TV (p 83) . . . Need for accelerated production was stressed as the International Association of Electrical Leagues met at Boston (p 84) . . . The Rocky Mountain Electrical League was told that the electrical industry is vital to mobilization (p 85) . . . A national policy of "pay as we go with taxes" was advocated at the meeting of the Indiana Electric Association (p 86) . . . And such technical subjects as corrosion prevention, arc furnace loads, and interconnection operations were discussed by the EEI Electrical Equipment Committee (p 87).

• • •

Ontario Hydro reports that in the East York section where its system is being changed from 25 to 60 cycles the average home had 5.5 pieces of equipment to be converted. It claims that in the Southern California Edison 50-to-60-cycle changeover the average was less than one.

The Federal Reserve Board's first new credit curbs lasted less than a month. Tougher restrictions on installment buying went into effect Oct. 16. They require cash down payment of 25%—instead of 15%—and permit only 15 months—instead of 18—to pay off the remainder in purchasing TV sets, radios, refrigerators, and all other major durables.

The Pacific Northwest can look to low-grade coal as a solution of its power generation problems if a report of the Washington Experiment Station can be believed. The report indicates that the billions of tons of sub-bituminous coal in the state will make it possible to erect steam stations which can produce energy for as little as 5 mills per kwhr.

W. Stuart Symington of NSRB is talking about expanding the aluminum industry. He wants another 2 billion lb a year.

General Electric Co has boosted the price of turbine generators 10% as of Oct 16.

The net income of the Utility Workers Union of America, CIO, is declining. The financial report for the year ended June 30, filed in compliance with the Taft-Hartley Act, showed a net income of $13,500 or $8,400 less than the year before. Income rose but expenses rose more.

Union Electric Co of Missouri reports that 24 of its employees were called into the Armed Services in August.

King Coal is again on the march in the electric utility industry. August coal consumption was 8,117,862 tons or 15.5% over a year ago and 14.6% over the 7,081,809 tons consumed in July. Stockpiles at utility plants are also growing. On Sept. 1 they amounted to 27,467,273 tons, only 6.7% less than a year ago.

If John L. Lewis doesn't pull one of his surprise strikes, soft coal production will be much higher in 1950 than it was in 1949. At present production is 6.5% above last year.

Notes From The News

Richmond, Va., has sold the electric distribution system at Richard E. Byrd Airport to Virginia Electric & Power Co for $35,000. The city had acquired the system in 1947 from the U. S. Government . . . Lansing (Mich.) Electric Light Department will begin installation of a 31,250-kw turbine generator at its Ottawa Street Plant soon. The generator will be capable of supplying one third of Lansing's power needs . . . The Arkansas Public Service Commission has approved the sale of the Arkansas Power & Light Co dam on the Illinois Bayou to the Russellville Water Co. The commission approved the sale price of $25,000 . . . David B. Carson, vice president of Sharon Steel Corp. has been selected to administer the Commerce Department's controls over iron and steel.

Industry Advisory Council Selected

21 Officials of Private Companies among 30 Named by Chapman; All Sections of Country Represented; First Meeting Agenda Announced

A 30-MAN electric utility defense advisory council—with 21 members representing privately owned electric utilities—was named last week by Interior's Secretary and power administrator, Oscar L. Chapman. ELECTRICAL WORLD went to press on the eve of the council's first meeting on Oct 19.

In addition to the private utility executives four officials of municipal systems, two federal power members, a state power official, a representative of state regulatory bodies, and a cooperative association official will serve as members of the council. Five federal agencies will have participating representatives at council meetings while four other agencies will designate observers to attend the sessions.

4 Agencies Will Have Observers

The agencies which will have observers are the Atomic Energy Commission, the Munitions Board, the National Production Authority, and the Bureau of the Budget.

Chapman will serve as council chairman with D. L. Marlett, assistant administrator of the Bonneville Power Administration and acting deputy administrator for electric power, as vice chairman.

Chairman W. Stuart Symington of NSRB was invited to meet with the council at its first session to discuss the overall defense situation. Edward Falck, director of NSRB's Office of Energy and Utilities, was expected to present a survey of the power situation in relation to defense needs, probably in the form of an updating of NSRB's *Third National Electric Power Survey*, released last April.

Agenda for First Meeting

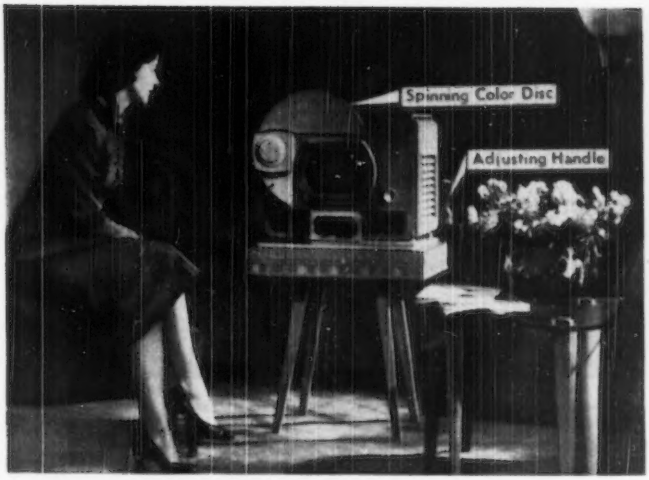
Other items on the agenda for the first meeting included the Defense Production Act; organization of the Defense Power Administration at Interior; and discussions of the electric utility materials and equipment situation and potential controls actions on power operations, materials controls, construction and maintenance, repair and operation supplies and services.

Still vacant as the council met was the post of deputy administrator for electric power. This is slated to go to an industry man who will serve under Chapman and organize and operate the power controls office at Interior. Marlett is now serving as a temporary deputy; he is being assisted by industry officials and Interior staff personnel.

An examination of the membership of the advisory council (See box) reveals that Secretary Chapman has been successful in securing men who represent all ideologies in the power industry and all sections of the country.

Electric Utility Defense Advisory Council

MEMBERS FROM PRIVATE COMPANIES		
D. E. Ackers	President	Kansas Power & Light Co
Alex D. Bailey	Vice President	Commonwealth Edison Co
J. B. Black	President	Pacific Gas & Electric Co
Prentiss Brown	Chairman of Board	Detroit Edison Co
H. B. Bryans	President	Philadelphia Electric Co
Harlan C. Forbes	Executive Vice President	Consolidated Edison Co
George M. Gadsby	President	Utah Power & Light Co
J. E. Loiseau	President	Public Service Co of Colorado
J. W. McAfee	President	Union Electric Co of Missouri
O. J. Miller	Vice President	Duke Power Co
I. L. Moore	President	New England Electric System
James H. Polhemus	President	Portland General Electric Co
Walter H. Sammis	President	Ohio Edison Co
H. B. Sargent	President	Central Arizona Power & Light Co
H. J. Scholz	President	Southern Services, Inc
Philip Sporn	President	American Gas & Electric Co
Louis V. Sutton	President	Carolina Power & Light Co and of EEI
Albert F. Tegen	President	General Public Utilities Corp
J. B. Thomas	President	Texas Electric Service Co
Allen Van Wyck	President	Illinois Power Co
F. M. Wilkes	President	Southwestern Gas & Electric Co
MEMBERS FROM MUNICIPAL SYSTEMS		
States R. Finley	Superintendent	Electric Power Board of Chattanooga
	President	American Public Power Association
Ivan L. Bateman	Electric Engineer	Department of Water & Power, Los Angeles
R. B. Cowan	Manager	Electric and Water Utilities, Jacksonville, Fla.
J. Frank Ward	Superintendent	Light Division, Tacoma, Wash.
OTHER MEMBERS		
Eugene Laughlin	Chairman	Connecticut Public Utilities Commission
	Representative	National Association Railroad and Utilities Commissioners
Charles F. Terrell	Executive Director	Nebraska Public Power System
Paul J. Raver	Administrator	Bonneville Power Administration
G. O. Wessenauer	Manager of Power	Tennessee Valley Authority
Clyde T. Ellis	Executive Manager	National Rural Electric Cooperative Assoc
PARTICIPANTS IN COUNCIL MEETINGS		
Edward Falck	Director	Office of Energy and Utilities, NSRB
E. Robert deLuccia	Chief	Bureau of Power, FPC
Carl Giroux	Special Assistant to Chief Engineer	Army Corps of Engineers
William C. Wise	Assistant Administrator	Rural Electrification Administration
William E. Warne	Assistant Secretary	Department of Interior



THIS STANDARD 10-in. table model television receiver has been adapted to receive color telecasts as well as standard black and white transmission by means of a Columbia Broadcasting System adapter and converter. The spinning color disk is divided into red, green, and blue segments. It is synchronized so proper color segment is in position for image being received. If CBS color TV is to succeed, all present television sets will have to be equipped with such an adapter and converter at a cost not yet determined

RCA, Pilot File Suits to Overturn FCC Decision on Color Television

RESENTMENT of the Federal Communication Commission order approving Columbia Broadcasting System's color television method crystallized into action last week when Radio Corporation of America and Pilot Radio Corp filed separate court suits seeking to block the decision.

The companies asked for temporary restraining orders pending trial for permanent injunctions. Columbia color broadcasts are slated to start Nov 20.

The two companies charged that the decision of the commission was arbitrary, capricious, and contrary to the public interest. RCA claimed that FCC had relied heavily on the advice of an unnamed staff engineer who had invented and applied for a patent on a device usable only with CBS's system.

Congress also may take a hand in the controversy. Rep. Robert Crosser, chairman of the House Interstate Commerce Committee, which has jurisdiction over FCC, said he would present the issue to the committee when Congress reconvenes Nov 27.

General Washington reaction was that authorization of CBS's field sequential system for commercial use actually gave the network little more than a beachhead.

Every development since the announcement that this mechanical system of color-casting could go on the air begining Nov 20 indicates that in the job of exploiting this system CBS must start off practically alone.

The concensus is that to get going CBS must undertake a gigantic promotional campaign, the principal objectives of which would be: 1. To convince a substantial number of almost 8 million TV set owners that color is worth the increased price, 2. to persuade prospective buyers that color sets when available will be worth the additional cost 3. to broaden the manufacturing base so that the public will not depend upon a fringe of small manufacturers who are the only ones to date that have indicated they will make the converters and adapters necessary to receive color programs.

Another stumbling block in the way of CBS is the war situation. Color could be delayed indefinitely as a result of shortages in components and raw materials such as copper and nickel. Copper manufacturers already have told industry that they can supply only a fraction of its requirements for TV components.

To date no sets have been designed combining facilities for both CBS color and the present system of black and white. It has been estimated that these sets will cost 50% more than present ones.

Bracket standards to allow for broadcasting both systems have not been adopted by the commission. In its second TV report the commission said that in the face of the arguments of manufacturers it would not adopt bracket standards without a hearing to be scheduled later. There is nothing to prevent a manufacturer from making a set with whatever bracket standards he may devise, but he runs the risk that it may become obsolete.

Several small companies have announced that they will have these devices on the market soon. Costs are estimated at $100 or more with installation.

The maximum image of the CBS colorcast is 12½ in. even on a 16 or 19-in. screen. The screen size of the color image is limited by the size of the color wheel unit which is placed in front of the set for the colorcast.

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86.3% of Nation's Farms Served by Central Stations

Central station electric service reaches 5,053,676 farms, or 86.3% of those in the nation.

Latest figures, compiled by the Rural Electrification Administration as of June 30, show that 805,493 of the 5,859,169 farms tabulated in the 1945 agricultural census are unelectrified. Farm figures for the 1950 census are not yet available. The farm total does not include hundreds of thousands of unelectrified rural non-farm dwellings, churches, schools, cross-roads businesses, and other rural establishments.

A total of 471,660 farms received electric service for the first time during the year ended last June 30, fewer than during the previous year in which a record 562,000 farms were connected.

Highest ranking states in farm electrification are Connecticut and Rhode Island, both with 99.9% of the farms electrified. Four farms in Rhode Island are without central station service and 25 in Connecticut.

Other states with more than 99 of every 100 farms electrified are Ohio, 99.6%; Oregon, 99.5%; New Jersey, 99.4%; and Michigan, 99.1%. Greatest numbers of farms with electricity are in Texas, 334,506 (86.9%); North Carolina, 254,568 (88.6%); Ohio, 219,743 (99.6%); and Georgia, 216,195 (95.7%).

North Dakota has the smallest percentage of electrified farms, 55.6%, followed by Mississippi, 57.7%, and South Dakota, 60.1%.

General Electric Co photo

IAEL GROUPINGS include, left to right, B. D. Fisher and William Freudigman, Narragansett Electric Co; A. J. Moore, General Electric Co, and J. G. Waddell, Electric Institute of Boston. In right panel, in the same order, are William T. Stuart, editor, "Electrical Construction and Maintenance;" O. C. Small, National Electrical Manufacturers Association; and A. H. Johnson, J. Walter Thompson Co

Need for Accelerated Production Stressed at Electric League Meet

NECESSITY for an accelerated rate of production was the common ground for two principal speakers at the annual meeting of the International Association of Electrical Leagues in Boston, Oct 11-14. But from that ground they went different ways.

Dexter Keezer, McGraw-Hill economist, saw increased production as about the only deterrent of a desperately dangerous inflation ahead, which will be promoted by military and foreign-aid spending and by the coming excess profits tax. Neither credit restrictions nor price and wage controls will be effective in stopping or even retarding the inflationary trend, he said.

Arno H. Johnson, research director of J. Walter Thompson Co, took a more cheerful view. Actual purchasing power for civilian goods, after correction for taxes and for inflation, will remain high, he asserted. And there will be goods available to absorb this purchasing power as production efficiency is raised. In fact, there is ahead a major selling job of raising the standard of living of those large population groups whose incomes are being increased. He pointed out that families moving up from poorer to better income groups must be sold the improved standard of living which their larger incomes allow them. Market potentialities have always been underestimated, he said, and the job to be done is to set selling sights high so as to build up a civilian economy capable of carrying the military and foreign aid load.

What is needed now, said A. H. Kessler, IAEL president, in his opening address, is positive planning for continued sales and promotional operations as opposed to a do-nothing policy of waiting to see what is going to happen. Conditions now are about the same as before the last war, and we should profit from the lessons learned then.

To promote electrical appliances in today's market, Roger Bolin, Westinghouse Electric Corp, urged increased use of demonstrations as selling aids, reconsideration of the sales potentialities of small appliances, pushing newcomers in the major appliance group such as the clothes dryer and the food freezer, improvement in appliance servicing, and increased effort on adequate wiring.

According to safety requirements as incorporated in the latest edition of the wiring code, simple logic says that wiring not meeting those requirements is unsafe. Rather a harsh conclusion, admitted J. H. Van Aernam, Niagara Mohawk Power Corp, but quite true if old wiring is over-fused or plugged with pennies so that modern appliances will operate. This was the reason why his company embarked, some years back, on an intensive campaign to educate its residential customers to appre-

General Electric Co photo

JOHN MORRISON, left, Electrical Association of Philadelphia, and E. E. Samson, Electric Institute of Washington

General Electric Co photo

RALPH NEUMULLER, left, Electric & Gas Association of New York; A. H. Kessler, North Central Electrical Industries

ciate blown fuses as warnings of unsafe conditions, not as annoyances.

There is scarcely a segment of the electrical industry that has not been seriously affected by L-P gas competition, and the industry cannot afford to overlook or minimize it, asserted J. Rushton, Frigidaire. Meeting this competition is a sales job that should not be neglected and that will require organized effort for accomplishment.

The cost of planned lighting need not be a major stumbling block to a sale, asserted L. E. Johnson, Northern States Power Co. He presented an analysis of 1929, 1939 and 1949 lighting costs in an actual office as proof of his statement. Twenty years ago this office had lighting of 10 ft-c average intensity, in 1939 intensity was raised to 20 ft-c, and today it is 50 ft-c. But with five times the light, the ratio of lighting cost to employee payroll is slightly less today than in 1929.

H. W. Bennett, Employee Relations Division, General Electric Co, told how GE is trying to get over to employees an understanding of the American business system. He demonstrated the technique of group discussion meetings in which the values of our system are explained as against the lack of those values under socialistic and communistic governments.

Officers elected were president, H. P. Wilson, Electrical Institute of the Tri-Cities; vice-president, J. G. Waddell, Electric Institute of Boston; treasurer, R. B. Hubbard, Rocky Mountain Electrical League; secretary, W. G. Hills, Electrical Institute of Washington.

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Registration of Engineers in D. C. Voted by Congress

Congress has completed action on a bill requiring the registration of professional engineers in the District of Columbia. The bill goes into effect 90 days after enactment.

The District is the last area in the United States to be covered by engineer registration legislation. Licensing laws are in effect in all 48 states, Alaska, Hawaii, and Puerto Rico.

The bill, which provides for the establishment of a five-man registration board, includes a "grandfather" clause —good for one year—to enable engineers who have resided in the District or practised there for a year prior to enactment of the law to apply for registration. A heavy flood of applications is expected during the first year before this provision expires. Large numbers of federal government engineers working in and around the District have been awaiting the opportunity to register.

Industry Important to Mobilization, Rocky Mt Electrical League Told

OUR ELECTRIC INDUSTRY is a vital factor in building the military, economic, and moral strength our nation must have to win the world-wide conflict which exists today. And our industry must accept the responsibility for an organized effort which goes far beyond any limited goal of self-preservation. This was the message of Henry B. Sargent, president of Central Arizona Light & Power Co, to the 47th annual convention of the Rocky Mountain Electrical League at Colorado Springs, Oct 8-11.

Says Power Available

He pointed out that the production of arms and equipment which go into building military strength is directly dependent on the availability of electric power—and that power is available today. Improved techniques and equipment have enabled the industry to contribute the one component of production which has decreased in cost in the face of almost universal increase in costs of other components. The industry has also opposed wasteful expenditures of funds for costly duplication of facilities and advocated elimination of tax subsidies to help strengthen our economy. Most important, it has been in the vanguard of the fight against the socialistic trend toward government in business, the greatest threat today to personal liberty, political freedom, and equality of opportunity.

Harsh, arbitrary administrative regulation by broad interpretation of existing laws is the thing most to be feared in fighting socialization of the electric utility industry, said T. E. Roach, president of Idaho Power Co. Application of the preference clause, which is the cornerstone of public power promotion, and bureaucratic control of lands in public domain may accomplish the same end as the valley authority proposals which have been pretty well discredited in the Pacific Northwest, he warned. He recommended opposing socialism on the broad basis of its overall implications, rather than because of its effect on the industry alone.

Describes Cooperation on Snake

He also recounted the successful program of his own company in cooperating with the Bureau of Reclamation to develop the power potential of the Snake River. By actively supporting all sound, practicable irrigation projects and agreeing to buy all power they produce, his company has succeeded in keeping Bureau attention focused on irrigation and flood control —its primary purpose.

T. E. ROACH, left, president, Idaho Power Co, and Henry B. Sargent, president, Central Arizona Light & Power Co, spoke at Rocky Mountain Electrical League meeting

Ability of the electrical industry to meet the requirements of the present and immediate future was documented by R. S. Kersh, Westinghouse Central Station Department manager. Since 1941, generating capacity has increased 55%, manufacturers' production is up 350%, and electrical contractors have stepped up volume of construction 500%. He warned that under conditions of only limited curtailment of civilian production we may be in bad need of an aggressive selling organization.

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Orders 40,000-Kw Unit

Public Service Co of New Hampshire has ordered a 40,000-kw unit for delivery in 1952. The unit will probably be installed at Portsmouth or Manchester.

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Utility Sells 66-Kv Line

Kentucky Utilities Co has sold a 66-kv line to Louisville Gas & Electric Co for a reported $76,500. The line, which is in LG&E territory, is used to interconnect the companies.

IEA OFFICERS group includes, left to right, Vice President H. T. Pritchard, President C. V. Sorenson, retiring President H. D. Anderson, and Secretary Treasurer H. F. Hauser. In right panel are three program participants: L. R. Boulware, A. B. Kline, and L. V. Sutton

'Pay as We Go with Taxes' Urged at Indiana Electric Group Meeting

A NATIONAL POLICY of "pay as we go with taxes" was advocated by two speakers at the Indiana Electric Association's annual convention at French Lick, Oct 11-13.

Allan B. Kline, president, American Farm Bureau Association, said that we will lose 12 to 15% of our productive effectiveness if we go into price ceilings now, and the best solution to the problem of shortage is a policy of "pay as we go with taxes."

Congressman Edward H. Kruse, Jr. of Indiana supported this stand. He advocated reducing non-essential expenditures in order to pay for our military needs and said that our basic strength lies in our system of private and free enterprise.

Louis V. Sutton, president of Carolina Power & Light Co. and Edison Electric Institute, urged that every utility make the fight against the socialization of the power industry a matter of first importance. He proposed that:

1. All trade organizations carrying on this fight be supported.

2. Employee publications and advertising be used to tell the industry's story.

3. The press and radio be kept informed of the industry's position.

4. Every executive learn how the American economic system works and how his own company fits into it.

5. Management and employees know and contact representatives in Congress.

Tell the American economic story beyond the confines of your own plant, advised L. R. Boulware, vice president, General Electric Co. He emphasized the uselessness of telling the story to employees and having them go out where they are overpowered by friends, relatives, union associates, and clergy who have been filled with wrong ideas and who by virtue of numbers and zeal overpower the employees with ideas not based on fact. Boulware said that organized education and organized religion have failed to teach men what they should do and to get them to do it; so business must.

Tom Fort, manager of apparatus sales, Westinghouse Electric Corp, pointed out that while large quantities of World War II equipment are obsolete, the factories that made them are not. He said that electrical manufacturers are prepared to convert their facilities to meet any military needs.

Pointing out that twice as many workers are killed and injured off the job as on, Ned H. Dearborn, president, National Safety Council, said it is time business woke up to this fact and gave more support to organized efforts to prevent accidents off the job.

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Bargaining Election Denied

The National Labor Relations Board has denied the United Plant Guard Workers of America, Local 516, permission to hold a bargaining election among guards and gatemen at Niagara Mohawk Power Corp's. Huntley Station near Buffalo. The board ruled that the guards and gatemen would have to organize on a systemwide basis as Niagara Mohawk's other workers have. The utility has bargained on this basis since 1948 with the AFL International Brotherhood of Electrical Workers in regard to other types of employees.

Group Named to Study New England Resources

President Truman has ordered six federal agencies to proceed with the comprehensive survey of resources of New England and New York which the Eighty-first Congress has declined to authorize.

Various bills were introduced in the past two years to authorize the survey, but Congress approved only a limited study by the Corps of Engineers in the Rivers and Harbors and Flood Control Authorization Act. Taking note of this, the President named the Department of the Army as chairman of a temporary interagency committee to make the survey. Other agencies on the committee are the Departments of Interior, Agriculture, and Commerce, the Federal Power Commission, and the Federal Security Agency.

The President also wrote to the governors of the six New England states and New York asking them to name official representatives to work with the federal group.

The Presidential letter calling for the survey came Oct 11, a few days after a group of Democratic Congressmen from the region had urged action.

The committee's job, as set forth by the President, will be, "initiating a comprehensive survey of the resources of this region, and preparing recommendations for the development, utilization and conservation of those resources."

Heading the list of resources to be covered by the study was electric power generation and transmission.

"It is my desire that the survey be undertaken as soon as practicable and that the joint report be submitted for my consideration not later than July 1, 1952," the President wrote.

WHEN PUBLIC SERVICE CO OF COLORADO connected its 200,000th customer, Pres J. E. Loiseau, left, called to present his congratulations and a number of gifts. The lucky customer was Lawrence Desmond, shown with his wife and two children at their home in Denver

Corrosion Prevention, Arc Furnace Loads Discussed by EEI Group

CORROSION PREVENTION, arc furnace loads, and interconnection operation were recognized as prime matters of current concern at the meeting of the Edison Electric Institute Electrical Equipment Committee at Old Point Comfort, Va., Oct 9-10.

Techniques of painting focussed attention on the corrosion topic after E. J. Higgins had told of practices and experiences by American Gas & Electric Service companies particularly on substation structures, fences, and transmission towers. Nine gauge aluminum fence fabric survived exposure to corrosive atmospheres well but turned objectionably black. Stainless steel (13-Ga. 18 Cr-8 Ni) out-performed both aluminum and galvanized steel (9 Ga). Costs per lineal foot of 6-ft fence were reported as $1.12, 98¢ and 61¢ respectively, the latter for 1.2 oz zinc per sq ft. On this basis stainless steel was the chosen material for the long-term economy.

Fences are cleaned with 18-in. wire-centered horsehair brushes and one-coat painted by two men on opposite sides using 18-in. janitor brushes and applying a paint composed of aluminum and lead pigments and thinned one-third. A later paint is essentially aluminum pigment with inhibitor. Flow coating is used for transformers and their radiators. Costs of 7.4¢ per sq ft were cited covering labor, overhead, and materials. Low-pigment dark green has proven superior to the conventional blue-gray applied by equipment manufacturers.

Money can be utterly wasted on a paint job unless the surface has been properly prepared and the right paint is used and properly applied, said D. W. Taylor, Public Service Electric & Gas Co. Suboxide of aluminum and lead in tung oil have proven satisfactory over 20 years on the Vepco system, according to J. A. Rawls. S. M. Hamill said Cincinnati Gas & Electric Co was inclined to let a slight amount of rust form and act as a grip for the paint.

"Play safe in system planning wherever electric steel melting is concerned," was a word of caution injected by B. M. Jones, Duquesne Light Co, in presenting his company's load experience with arc furnaces totalling 170,000 kva and somewhat widely scattered. It is generally advisable to install over-sized transformers because the user will learn how to increase output as crews become increasingly skilled. Many firms buy additional units of larger size at increasingly shorter intervals, and this must be anticipated in line design, he said.

Techniques of operating and billing on the Pa.-N. J. and Southern Companies' interconnections were discussed in detail by H. W. Phillips and E. D. Early, respectively. Phillips said that 6% of spinning reserve is the present practice with another 6% for down-maintenance and a likelihood of raising the overall planned reserve to 15% as a minimum objective because of the flatness of the seasonal load curve and the limited opportunity for overhaul.

Inspection trips were made to the 25 to 45-Mw wind tunnels of the NACA at Langley Field and to the Virginia Electric & Power Co's Chesterfield Station where a third unit is to be installed.

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Niagara Mohawk Plans to Build $2-Million Dam

Niagara Mohawk Power Corp has applied for a Federal Power Commission license to build a dam and storage reservoir at Carry Falls on the Raquette River near Potsdam, N. Y.

Immediate purpose of the $2-million project is to increase the production of nine company hydroelectric generating plants downstream from Carry Falls by providing them with a more even flow of water throughout the year. The storage reservoirs would provide enough additional water to increase output of the plants by 31 million kwhr a year. Later the company plans to build other plants immediately downstream from the reservoir with a total installed capacity of 90,000 kw.

The concrete dam across the river would be 830 ft long and 70 ft high. Five earth dikes varying in length from 300 ft to 1,000 ft would be built at various points around the reservoir. About 5 billion cu ft of water would be stored by the five-mile-long, 3,150-acre reservoir.

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Jacobson Joins AEC to Spread Atom Publicity

The Atomic Energy Commission promises more technological information in the field of atomic energy to industry and the industrial press.

Norman H. Jacobson, who has been supervisor of industrial press relations for Allis-Chalmers Manufacturing Co, Milwaukee, for the past ten years, has been added to the AEC staff in Washington to carry out this program. As technological information officer, he will assist the Chief of Technical Information Service in developing policies and programs for the dissemination of such information.

Specifically, Jacobson's duties will include a continuous appraisal of AEC technological developments, arrangements for proper declassification of such information, and its publication where no security angle is involved.

YIELDS (%) — Operating Electric Utility Securities

Quality	Bonds			Preferred Stocks			Common Stocks		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
DATE									
1950									
Oct. 11	2.65	2.67	2.76	3.80	4.04	4.45	5.67	6.55	7.31
Oct. 5	2.66	2.66	2.76	3.80	4.06	4.45	5.63	6.52	7.26
END OF QTR									
3rd 1950	2.66	2.67	2.76	3.81	4.08	4.46	5.70	6.54	7.25
2nd 1950	2.68	2.66	2.74	3.79	4.03	4.38	5.38	6.51	7.50
1st 1950	2.59	2.61	2.74	3.78	4.01	4.36	5.22	5.85	6.67
4th 1949	2.59	2.61	2.79	3.85	4.06	4.46	5.37	6.15	7.01

Data: Reis & Chandler, Inc

Utilities Ask Congress for Fair EPT Treatment

A tax program to insure equitable treatment for utilities was submitted to Congress last week in the form of a joint report by the electric and gas industries.

Outcome of several months of discussion among utility leaders, the report was presented by Justin R. Whiting, president of Consumers Power Co, and J. French Robinson, president of East Ohio Gas Co. It is similar in general outline to the statement published by Edison Electric Institute last August (EW, Aug 28, p 68) but is more specific in its recommendations.

Utilities should be allowed minimum earnings of 6% on total invested capital, after deducting normal and surtaxes, before becoming subject to an excess profits tax, the report says. Less than this return would impair the industry's ability to raise new capital for its expansion program. Average return on total investment for electric utilities from 1946 through 1949, when the gas and electric industries raised $5,580 million in new money, was 6.3%.

Deduction of normal taxes and surtaxes before computation of excess profits taxes also was urged. Companies should be allowed to count 100% of their borrowed capital in their total invested capital. Other recommendations included a credit at an incentive rate for all capital additions made during and after the first excess profits tax year, allowance of 6% of all capital additions made during and after the last two years of the base period, elimination of penalties on reporting consolidated returns, and special provision for hardship cases.

The report called for the following method of establishing a point below which excess profits would not occur: "In the case of public utilities, the excess profits credit for any taxable year shall be not less than the aggregate of the normal tax and surtax plus an amount not less than 6% of the total of outstanding borrowed capital, capital stock, and surplus, as reflected on the corporate books of accounts, averaged from beginning and end of the taxable year, with a corresponding adjustment to excess profits net income for interest on borrowed capital."

PP&L Sold to Public; Syndicate Retains 40%

An offering of 1,078,754 shares of Pacific Power & Light Co common stock has been sold to the public at $14 a share less than 24 hours after the Securities and Exchange Commission had approved the offering over the protests of various public power groups.

The issue was about 60% of PP&L's 1,750,000 shares. The remaining stock was retained as an investment by the A. C. Allyn & Co-Bear, Stearns & Co syndicate that bought it from American Power & Light Co last February. The syndicate paid $16,125,000 for the entire block of stock. On the basis of the $13 a share it got after the underwriters' commission, the syndicate would have netted $6,625,000 had it sold all 1,750,000 shares.

FINANCIAL BRIEFS

Oct 24 has been set as the date for the consolidation of Long Island Lighting Co and its two subsidiaries, Queens Borough Gas & Electric Co and Nassau & Suffolk Lighting Co. The final barrier to the plan was removed when the United States Supreme Court refused to set aside lower court approvals of the reorganization. Three common stockholder groups had protested details of the plan.

The United States Supreme Court has agreed to rule on the value of warrants of companies reorganized under the Holding Company Act. The Securities and Exchange Commission gave warrant holders no share in the assets of Niagara Hudson Power Corp under the reorganization plan, but a circuit court held the warrants should receive some share. The Supreme Court decision is expected to affect several other reorganization plans.

The Federal Power Commission's rate jurisdiction will be reviewed by the United States Supreme Court. The high tribunal has agreed to hear the suit of Montana-Dakota Utilities Co asking $779,958 in alleged overcharges by Northwestern Public Service Co for power purchased at wholesale over a 10-year period. A district court ordered Northwestern to pay Montana-Dakota, but a circuit court dismissed the complaint on the grounds that FPC not the court has authority to determine reasonableness of rate.

A proposed election in Paducah, Ky., on the issue of buying Kentucky Utilities Co's plant there has been barred by the state's Court of Appeals on technical grounds related to the wording of the question. The referendum would have covered a $2.5-million bond issue to finance the project.

Final steps in the dissolution of Niagara Hudson Power Corp (EW, Sept 4, p 14) have been approved by the Securities and Exchange Commission. The commission has applied to the U. S. District Court in Albany, N. Y., for approval and enforcement.

Graybar Electric Co has registered 72,000 shares of its $20 par common stock, to be offered at $20 to employees under its stock purchase plan.

Electric Utility Financing—October 7-14

Company	Description	Amount of Offering (000)	Offering Price	Yield at Price to Public
Bonds				
Utah Power & Light	2¾% 1980, new money	$8,000	100.501%	2.85%
Common Stock				
Ohio Edison	396,571 sh new money	11,104	$28.00	7.14
Pacific Power & Light	1,078,744 sh from selling stockholders	15,102	14.00	7.86

SCHEDULED
Bonds—New Bedford Gas & Edison Light, Series B notes 1975, refunding, $3,750,000.
Preferred Stock—Alabama Power, 100,000 sh, $100 par, new money, $10 million.

NLRB to Apply T-H Act in Most Utility Disputes

From now on the National Labor Relations Board will use the Taft-Hartley Act in practically all cases involving a public utility.

The fact that a utility operates only within a state, or is essentially a local operation, will not deter the board from applying the three-year-old labor law if the utility, or a labor dispute involving it, has more than a trifling effect on commerce.

This was announced by NLRB in setting down a series of yardsticks which it will use in deciding when a dispute has a sufficient impact on commerce to warrant use of the law. Up till now, the board has used discretionary judgment in refusing to handle a case where the operations of the employer were "essentially local in character." But there was no fixed test of what was "essentially local."

Now the board has set down the tests it will use and which the new general counsel, George J. Bott, has agreed to follow in issuing complaints of unfair labor practice. The same will apply to elections.

One of the tests is whether a public utility or transit system is involved. The board will assert its jurisdiction over such an enterprise if it is engaged in commerce or in operations affecting commerce, subject only to the rule of "de minimis," meaning too trifling to bother with.

"Our experience has shown that public utilities . . . have such an important impact on commerce as to warrant our taking over all cases involving such enterprises," the board said, adding the qualification that commerce must be affected and that it be more than a trifling matter.

Practically all power utilities would meet this test.

The case in which the board announced the policy on public utilities involved a local transit system at Knoxville, Tenn.

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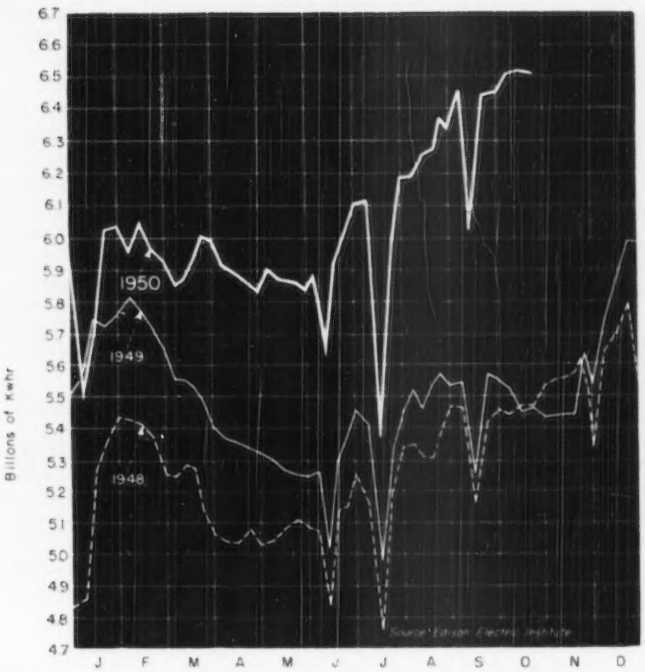
Utility Buys Co-op Area

Franklin Power & Light Co., Franklin, Tenn., one of the few surviving private power companies in the TVA area, has bought for $101,000 a 300-customer service area inside Franklin's recently expanded city limits. Seller was Middle Tennessee Electric Membership Corp., Murfreesboro, of which Assistant Secretary of Agriculture Knox T. Hutchinson is president. Franklin P&L has a franchise to serve all consumers inside the city.



Output Week Ended Oct 14—6,508,591,000 Kwhr

Weekly Output, Millions Kwhr						Percent Change from Previous Year			
1950		1949		1948			Oct 14	Oct 7	Sept 30
Oct 14	6,509	Oct 15	5,481	Oct 16	5,482	New England	+16.5	+16.6	+15.9
Oct 7	6,514	Oct 8	5,450	Oct 9	5,482	Mid-Atlantic	+16.1	+16.8	+16.9
Sept 30	6,503	Oct 1	5,521	Oct 2	5,449	Central Industrial	+29.0	+27.1	+21.5
Sept 23	6,457	Sept 24	5,556	Sept 25	5,461	West Central	+19.3	+17.6	+16.2
Sept 16	6,449	Sept 17	5,579	Sept 18	5,426	Southeast	+16.2	+16.1	+17.1
Sept 9	6,029	Sept 10	5,258	Sept 11	5,166	South Central	+17.5	+23.6	+21.9
Sept 2	6,459	Sept 3	5,544	Sept 4	5,470	Rocky Mountain	+16.8	+16.9	+16.5
Aug 26	6,346	Aug 27	5,523	Aug 28	5,478	Pacific Coast	+12.0	+15.6	+13.5
Aug 19	6,370	Aug 20	5,579	Aug 21	5,391				
Aug 12	6,253	Aug 13	5,530	Aug 14	5,318	Total United States	+18.8	+19.5	+17.8

MEETINGS

American Institute of Electrical Engineers
Fall General Meeting, Skirvin Hotel, Oklahoma City, Okla., October 23-27.

American Society of Mechanical Engineers
Fuels Conference, jointly with American Institute of Mining & Metallurgical Engineers, Hotel Statler, Cleveland, Ohio, October 24-25; Annual Meeting, Hotel Statler, New York, November 26-December 1; National Power Exposition, Grand Central Palace, New York, November 27-December 2.

Edison Electric Institute
Meter and Service Committee, Robert Treat Hotel, Newark, N. J., October 25-27; Industrial Relations Committee, Netherlands Plaza Hotel, Cincinnati, Ohio, November 13-16; Industrial Relations Committee, 420 Lexington Avenue, New York, December 13.

Pennsylvania Electric Association
Relay Committee, Berkshire Hotel, Lancaster, October 26; System Operation Committee, Hotel Lawrence, Erie, October 26-27; Prime Movers Committee, Hotel Benjamin Franklin, Philadelphia, November 2-3; Meter Committee, Hotel William Penn, Pittsburgh, November 9-10.

★**Pacific Coast Electrical Association**
Operating Economics Section, Whitcomb Hotel, San Francisco, Calif., November 2; Business Development Section, California Hotel, Fresno, Calif., November 9; Administrative Services Section, Hotel Clark, Los Angeles, Calif., November 16-17.

Wisconsin Utilities Association
Electric and Gas Section, Schroeder Hotel, Milwaukee, Wis., November 8-10.

Northwest Public Power Association
Accounting Section, St. Helena Hotel, Chehalis, Wash., November 9-10.

★**Southeastern Electric Exchange**
Accounting Conference, Tides Hotel, St. Petersburg, Fla., November 9-10.

National Electrical Manufacturers Association
Chalfonte-Haddon Hall, Atlantic City, N. J., November 13-16.

New Jersey Utilities Association
Annual Meeting, Seaview Country Club, Absecon, November 17-18.

American Standards Association
Annual Meeting, Waldorf-Astoria Hotel, New York, November 27-29.

★ Addition this week.

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Moves Headquarters

East Kentucky Rural Electric Cooperative will move its headquarters from Danville to Winchester.

WASHINGTON COMMENT

RONALD D. ROSS

AN UNIDENTIFIED gentleman with a keen feeling for brevity pretty well summed up the thoughts of the electric utility industry at this time when he wrote a letter the other day.

Addressed to the Secretary of the Interior, Washington, D. C., here is the complete epistle:

"Sir: What is your policy?"

The electric utilities have more specific questions and they deserve more specific answers than the letter writer who probably was sent a copy of the Secretary's last annual report. But many of the questions at the present stage of mobilization add up to: What is Interior's power control policy? Part of the answer has become clear in recent weeks.

Most important perhaps is the Dr Jekyll and Mr Hyde role assigned to Secretary Chapman. As an ardent—and effective—advocate of federal and public power, Chapman has long seemed to the private electric utilities to be a sort of villainous Mr Hyde. Now, as administrator of power controls, over the industry as well as federal operations, the Secretary is expected to be a neutral, impartial advocate of the nation's best interests—a benevolent Dr Jekyll. This reverses the pattern of the famous story in which the kindly Dr. Jekyll transformed himself into the sinister Mr Hyde.

This is a tough assignment, but it is the only acceptable method by which Chapman can be considered a satisfactory power control administrator. He must somehow contrive to disengage himself from Interior's power problems and disassociate himself from the philosophy of public power if he is to exercise fairly any controls over the 80% of the nation's power capacity which is owned by private investors. How well he succeeds will determine to a large degree how well the present control program works in the electric power field.

As Secretary of the Interior, Chapman will continue to press for federal power expansion, even arguing that it's necessary for defense. Assistant Secretary for Water and Power William E. Warne will direct a power program keyed to a more-federal-kilowatts-for-security theme. And Assistant Secretary C. Girard Davidson will make speeches for CVA and perhaps federal power for New England. Interior's power policies, plans, and dreams will not be changed by the control program.

On the other hand, Administrator of Power Chapman will work in large measure with industry men and groups in operating the controls program. These men will want to continue the expansion program of the private companies.

So the fundamental principle is separation of Interior's controversial power program from the broader job of maintaining and expanding the nation's power supply. This principle and Chapman's effort to promote it deserve warm applause from the industry.

So far, the separation principle has been observed pretty well, but it has had no serious challenge to face. There have been no priorities squabbles to arbitrate.

A real test of the separation policy may come soon. Tight supplies of materials and equipment or new, unforseen, emergency power demands can bring a clash between the views of private and public or federal power. Any such conflicts will bring both sides to the office of the Interior Secretary and Power Administrator to plead their causes.

When this happens, Secretary Chapman and Administrator Chapman may well ask each other, "What is your policy?"

TECHNICAL NOTES

ARCHER E. KNOWLTON

Men-working signs may not be adequate warning to vehicular traffic of up-in-the-air hazards of low-hanging wires.

Resuscitation has probably never been successful after 10-12 min of application unless some breathing had been restored to keep the brain supplied with oxygen.

Fibrillation of the heart may some day be safely stopped by a momentary discharge from a 5 μf condenser.

Aluminum alloy poles are to be expected as the scarcity of pole timber grows.

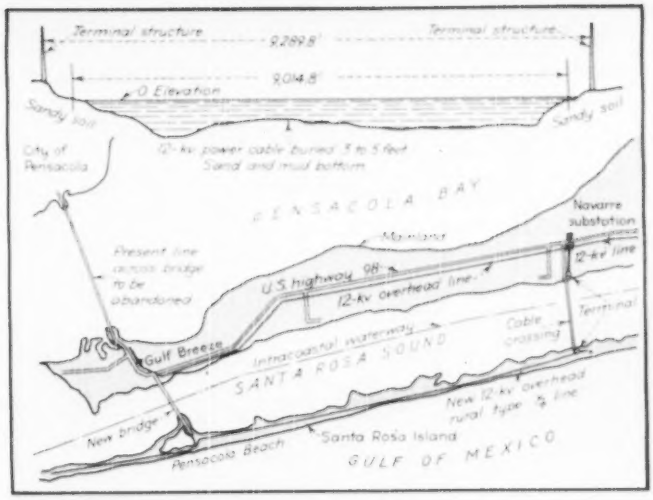
Truck body grounding would reduce driver and groundman risks while using the winch to pull in new conductors in proximity to energized ones; the ground had better be good.

Resistance measurements of substation grounds should be repeated with greater frequency if it is known or surmised that the water table is dropping.

Roping off both dead and live areas should probably not be practiced on the same system, lest the working crews be confused by the diametrical objectives.

Coupling between closely paralled transmission circuits can unbalance the zero sequence components of fault currents and interfere with normal ground relaying.

Lighting of plant interiors can avert the undesired brightness contrast between fluorescent tube surfaces and the otherwise dark ceiling if the sides of the conventional industrial fixtures are slotted to permit some upward illumination.



1 **CABLE CROSSING LOCATION** and elevation drawings show where the two 15-kv unarmored tapered submarine cables were installed

2 **TERMINAL STRUCTURE** for cables. Hand-hole cable pull box is just visible

Tapered Submarine Cable Without Armor Saves Over $22,000

Unusual 15-kv submarine cable 20,000 ft long has tapered conductors laid in sea water without protective armor. Cable size graduated in sections for uniform current capacity under varying ambient temperatures

F. G. **HAMNER**, General Engineer, Southern Services, Inc, Birmingham, Alabama
G. M. **DOYAL**, Distribution Engineer, Gulf Power Co, Pensacola, Florida

A 20,000-ft installation of 15-kv submarine cable has recently been completed by the Gulf Power Company of Pensacola, Florida, in which tapered conductors are laid in sea water without the protection of the usually specified armor wires. Laid across Santa Rosa Sound at a point near Navarre about ten miles east of Pensacola, Florida, its location is shown in Fig 1.

The installation consists of two, 3-ph cables each divided into six sections as shown in Table I. Cable sections were graduated in order to secure an over-all cable of reasonably uniform current carrying capacity under the varying ambient temperatures expected. The division points of the several sizes were arbitrarily chosen since it was impractical to taper the conductor uniformly with the ambient temperatures of earth and water.

In designing the cable, a total load carrying ability of 225 amp was required. With a 60% load factor the No. 2 sections, buried 5 ft in mud and water with a 30 C ambient, has a current carrying capacity of 173 amp. The 1/0 section, with an ambient of 40 C in mud and water, has a capacity of 190 amp. This is used in the very shallow section where the water temperature becomes very high (104 F) on hot, still days. The 250-Mcm sections were specified for the shore ends where the cable was pulled in duct buried in dry sand, and in an iron conduit above ground where the direct rays of the sun will strike.

Under emergency conditions (one cable out) the remaining cable will operate overloaded but with no section experiencing a copper temperature greater than 85 C. As this condition will seldom occur (and then for only a few hours a day for a few days) this temperature should not cause undue deterioration of the insulation. This 85 C was the principal element entering into the determination of the exact sizes specified. It is believed that one cable can carry 225 amp for a few hours without appreciable loss of life. The total normal current carrying ability of the two cables

3 **TWO DUCTS** encased in concrete protect cables at both shore ends from pull box at terminal to low water line

4 **DURING CABLE LAYING** barge was anchored close to shore. Cable was pulled by manpower through the duct to the terminal structure

5 **TERMINAL STRUCTURES** and course markers at north shore. After all four cable sections were laid, barge was anchored over the free ends, cables raised to barge and spliced. Two severe squalls occurred during 30 hr splicing of the two north sections of cable

in parallel will be approximately 350 amp. Thus, a third cable becomes a probable solution to the problem of additional capacity to the island whenever the load exceeds 350 amp (7,500 kva at 12.47 kv). Spare cable capacity is provided, however, only for the 225 amp mentioned above which corresponds to 4,850 kva. When the load reaches a value somewhere between this 4,850 kva and the 7,500 kva a decision must be reached relative to the installation of the third cable, the cost of which must be weighed against improvements to service, curtailment in emergencies, etc.

Conductor size was determined in the same manner as in other instances.

Tapered Cable Cheaper . . . In the present case, a total of 19,600 ft of cable was purchased. Riser and shore sections have a 250-Mcm conductor. If this conductor had been used for the entire crossing instead of No. 1/0 and No. 2 as the ambient temperature varied, the cable would have cost about $35,000 more. However, installation cost would have been considerably greater. For these reasons, it was economically attractive to taper the conductor size as the ambient temperatures varied along the route. Ideally, many conductor sizes would have been required but, practically, it was felt that nothing smaller than No. 2 should be used because of the mechanical strength. After several "cuts and trys" the three-step cable was decided upon.

Other sizes of conductors of different lengths could have been specified but after a number of comparisons it was found that the total cost was about the same for a five-size combination as for the three-size. As manufacturing lengths become smaller, the cost per foot increases and the cost of splices mounts.

A single large 3-ph cable would have been less costly but would have possessed no back-up service features. A severe storm could prevent any repair work from being carried out in the sound so that a loss of the cable would mean an outage to the island of perhaps a week or so.

Consideration was also given to the use of four 1-ph cables each of 200-amp capacity (one a spare) instead of the two 3-ph cables described. The four 1-ph cables would have had to be buried in individual trenches. As a result installation cost would have been about twice the cost of the two 3-ph cables.

No Lead Sheath . . . A paper and lead cable with armor would have been considerably heavier but all lead sheath constructions were ruled out because of the rapidity with which lead corrodes in the area. Both the

Section Sizes for Each of the Two Three-Phase, 15-kv Unarmored Cables

Section	Size Cu Cond.	Design Ambient Temp., °C	Strands	Length, Feet	Weight, Lb per Foot	Total Weight
North Shore	250,000	50	61	150	8.60	1,290
North Shallow Water	1/0	40	37	1,100	5.75	6,325
North Deep Water	2	30	19	4,800	5.16	24,768
South Deep Water	2	30	19	2,800	5.16	14,448
South Shallow Water	1/0	40	37	600	5.75	3,450
South Shore	250,000	50	61	150	8.60	1,290
Total				9,600		51,571

6 **CABLE ENTERING** pull box at base of terminal structure. Cable was pulled through duct by manpower to limit strain

soil and sea water react adversely on lead reducing its life appreciably.

A layer of saturated jute over the lead affords inadequate protection against the marine borers, found in the area, which damage lead cable by eating small holes in the sheath. No assurance can be given that a layer of jute would be 100% water-tight throughout its length. An opening no larger than a pin head would permit the borers to enter and do their damage. In 20,000 ft of such cable it would be naive to hope that no such pin hole existed in the jute, especially in view of the number of field splices that would be required.

With lead definitely out, only a rubber-insulated cable remained to be considered. Here the minor advantages are many. It is more flexible, easier to handle, and splicing is relatively simple. With a Neoprene jacket it is substantially immune to the corrosive elements to be found in the area. Its use was not long contested by any one engineer, operator or manufacturer. The only point of dissention involved the desirability of a steel wire jacket over a jute bedding.

No Armor Wire . . . It was, of course, realized that it is usually the practice of industry to protect submarine cable with steel armor of some type. This armor usually takes the form of concentrically wound galvanized steel wire of No. 6 or No. 4 gage, which serves only two principal functions: Protection of the cable from mechanical damage during the installation process and the rather questionable protection of the cable against tidal action of sand and rocks after installation. As a protection against mechanical damage from dredges and anchors, experience has shown the armor to be of little value as it generally corrodes to the extent of being a detriment after a very few years in salt water.

It was decided that by the exercise of proper care during the installation process and by burying the cable 3 to 5 ft, depending on navigational routes and channels all of the real and fancied advantages of armor could be realized. As armor adds materially to both the cost and weight of the cable an analysis was made of the economies which could be realized in both the initial cost and installation cost of the cable by its elimination. In this particular cable the omission of the armor represents a saving of approximately $22,000 in the cost of the cable alone. The reduction in weight of the cable by approximately 60 tons would also represent an estimated saving of several thousand dollars in transportation and installation cost.

These economies could not be ignored. While it was realized that to install a cable of this length without armor was a drastic departure from the accepted practices of the industry, it was decided to proceed with the design along this line. This decision was not entirely without precedent as three relatively short runs of submarine cable of comparable size had been installed without armor by the Gulf Power Company during the early stages of the war when steel was unobtainable. Operating experience on these three installations indicated that the principle was sound if properly executed.

The one concession to mechanical protection of the cable was made at the shore ends. Here the cable was pulled in duct encased in reinforced concrete a distance of 150 ft. This extended from just beyond the low water line to the pull boxes at the bases of the terminal structures.

This protection was provided on the shore ends principally because of severe beach erosion experienced along these shores during heavy storm.

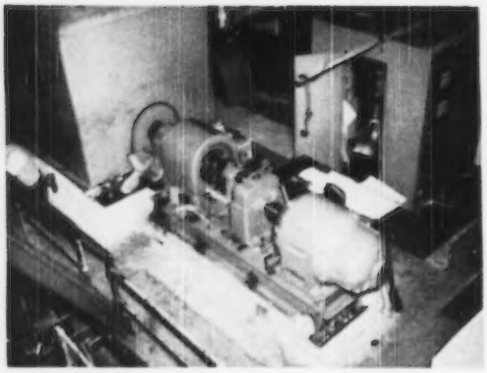
Cable Installation Details . . . The barge with the two reels containing both north sections of cable was brought as close to shore as possible and anchored. The cable was then pulled through the duct run and up to the pothead on the terminal structure. All pulling was done by man power to limit the possible strain that could be placed on the cable. The barge was then towed at a slow rate of speed on a marked course toward the south shore, with the cable unreeling as the barge progressed. Fig 5 gives a general view of operations off the north shore. When the end of the cable was reached a buoy and anchor were attached and the cable dropped over-board.

The same procedure was followed on the other sections, the parallel cables being layed 50 ft apart.

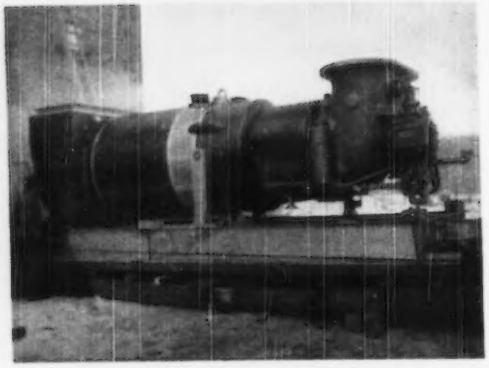
After all four sections of the cable were laid, a heavy barge was securely anchored over the free ends, the cables raised to the barge and spliced. The north sections of cable were made longer in order to place the splice nearer the island. This was done to take advantage of the shelter afforded by the island during splicing operations as prevailing winds are from the south in this locality. The splicing of the two cables required 30 hr and was not entirely without incident. Two severe squalls were experienced accompanied by water spouts, which narrowly missed the splicing barge.

After both cables were spliced and lowered to the bottom, they were tested, first by "meggering" phase-to-ground and phase-to-phase and then by the application of full 60-c potential applied for a period of several hours. The cables were de-energized during the burying operations.

The cable was energized in September 1949, and to date its performance has been perfect. However, sufficient time has not elapsed to warrant any conclusion other than it not being necessary to provide armor wire if sufficient care is used in installing the cable. Nothing can now damage the cable that would not also damage an armored cable. The terminations are well protected against all reasonable contingencies.



ELECTRICAL END of gas turbine unit with housed-in generator, exciter, reduction gearing and starting motor, during installation work



GAS TURBINE AND COMPRESSOR SECTION of unit entering station during construction period

Gas Turbine Unit on Line In Four Minutes

Central Maine Power Co equips peaking plant near load center with 3,500-kw gas turbine-generator set replacing obsolescent steam unit

CENTRAL Maine Power Company's first gas turbine unit and the second in the utility industry is now available for peak and supplementary service at Farmingdale station. Since the installation was completed and put on the line, the unit has been held in reserve as planned. This General Electric machine has a capability rating of 4,000 kw. It was purposely designed without present arrangements for utilizing exhaust heat from the discharged gas. Located near the load center of the system and fitting nicely into the layout of a former exclusively steam turbine station, the unit can be put on the line in a few minutes in comparison with the hours required by the older machines.

Farmingdale station was first operated in 1912. It was expanded to include six hand-fired boilers and three steam turbogenerators, with a combined rating of 7,500 kw. One 3,500-kw and two 2,000-kw units comprised the installation. Under normal conditions Central Maine Power derives the bulk of its output from hydro plants. However, back-up steam has been necessary on the system, notably in the Lewiston-Auburn area, Portland and Wiscasset. The Wiscasset plant (Mason station) is a two-unit, 40,000-kw tidewater installation of thoroughly modern design, and has a net economy of about 13,000 Btu per kwhr. Although the Fernald law, long on the books of the state, forbids exportation of hydroelectric energy from Maine, the system is well interconnected internally; has a major tie with the Bangor Hydro-Electric Co and an incoming 110-kv tie line from the Public Service Co of New Hampshire.

Quick Starting A Factor . . . The decision to purchase a gas turbine unit to be installed at Farmingdale hinged mainly on its availability for short-notice production. By removing one of the 2,000-kw steam units and one of the older boilers, space was provided for the gas turbine, exciters and a duplex control switchboard. The station is located on the west bank of the Kennebec River, which supplied condensing water for the steam units. The river also furnishes water for generator cooling.

The gas turbine rates at 3,500 kw and 6,630 rpm. It is designed for full-load operation only, as the fuel consumption even at no load is in excess of half the requirements at 100% load. The expected over-all operating efficiency at full load is about 17% at the generator terminals, or equivalent to a production of about 8 kwhr per gallon of fuel. Bunker C residual oil is burned, and the plant is the first of its kind in this respect.

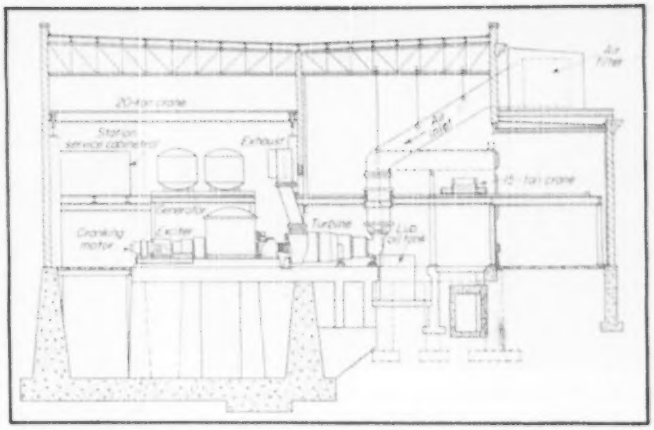
The gas turbine (a 2-stage, open cycle unit) is started on diesel oil. It

is automatically switched over to Bunker C after this oil has been pumped from a 300,000-gal heated underground tank through heaters to centrifuges and from there to a 600-gal day tank. From the day tank the fuel oil is pumped through another heater to the turbine. This heating is necessary because Bunker C is a thick, viscous crude oil residue which virtually solidifies on cooling. Before shutdown of the unit, the fuel is switched back to diesel oil in order to purge the fuel lines of the heavy oil which would solidify on cooling.

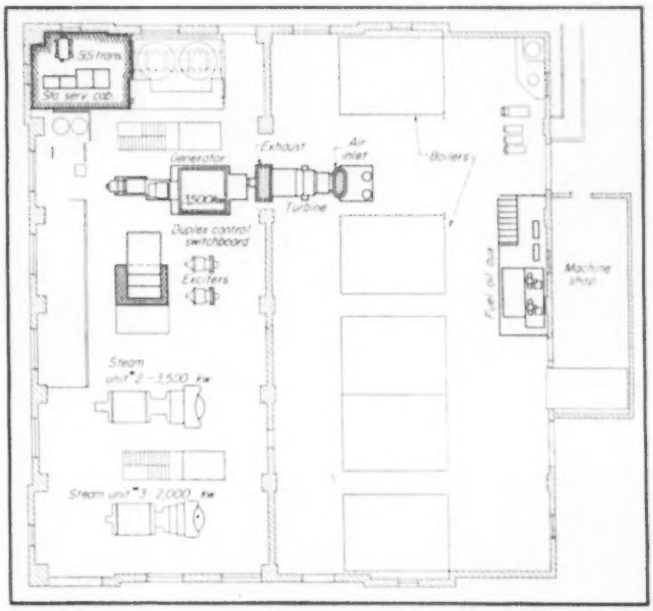
Control is automatic . . . A self-starter driven by a 250-hp, 480-v motor performs in sequence all the operations required to start and stop the unit. Other auxiliaries include two 7.5-hp cooling water pumps; two 3-hp centrifuge pumps; two 1-hp diesel fuel oil pumps; and two Bunker C fuel oil pumps, first stage. A 2-hp motor for turning gear is also provided. Supervisory control is provided also. Thermocouples are supplied for measuring temperatures of lubricating oil in and out of the cooler, bearings, turbine exhaust (this is about 780 F), compressor inlet and discharge, wheel space in the turbine, and other points. Oil cooler requirements are 75 gpm at 75 F. Exhaust gas discharge area totals 1,950 sq in. Over-all unit length is 49 ft 6 in. and width 8 ft 6 in. Total weight of unit was 88,500 lb including lubricating oil tank and pumps.

The operator turns a switch to start after a green light shows some 12 conditions have been checked by the controls. Turning gear rotates the unit at about 2 rpm. A cranking motor spins it at 10% speed for a few minutes, to purge firing chambers and ducts, and then begins bringing it up to speed. Diesel oil enters and ignition begins. At about 30% speed, diesel oil gives way to Bunker C. Then operator takes over, adds field, picks up speed, synchronizes and goes on the line.

Maximum starting time is about 4 min. In this installation air preheaters, intercoolers and regenerators were omitted. The governor is remotely adjustable over a speed range of about 5% plus or minus. The unit has an emergency over speed governor normally set to operate at 110% of normal speed, when it trips a stop valve in the fuel line installation. The air compressor is a 15-stage unit. It is of the axial flow type and receives air at 14.7 psia and at 80 F, delivering 94 lb per sec at 86.7 psia. Inlet temperature at the gas turbine is 1,400 F.



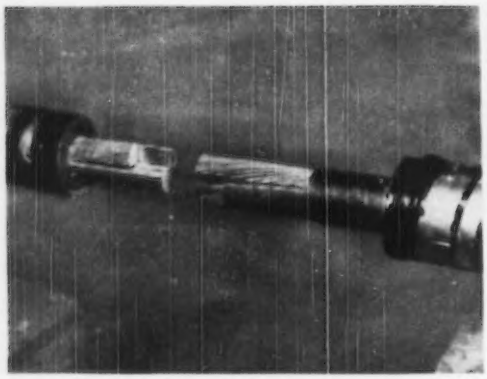
FARMINGDALE STATION in cross section shows gas turbine unit in location formerly covered by steam unit of half gas turbine capability rating of 4,000 kw



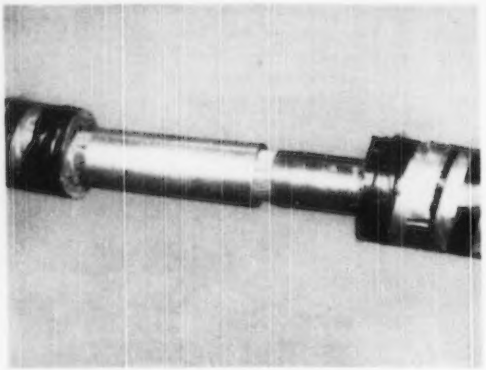
SPACE FORMERLY OCCUPIED by 2,000-kw steam unit and one of the boilers was given over to the 3,500-kw gas turbine, exciters, and a duplex control switchboard

Energy is generated at 4,160 v, 3-ph; and stepped up to 33 kv by a 5,000-kva, 3-ph transformer for delivery to an outdoor bus. From this bus various 33-kv outgoing lines proceed, and the two remaining steam turbo-generators also feed this bus through suitable transformers. Local distribution is also provided at 4,160 v. The station's 33-kv bus is connected to a 15,000-kva transformer installation which raises the voltage to 115 kv for a tie-in with the main transmission system of the company.

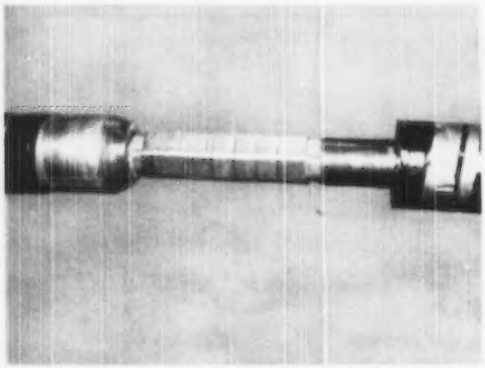
First cost of the new installation was about $125 per kw.



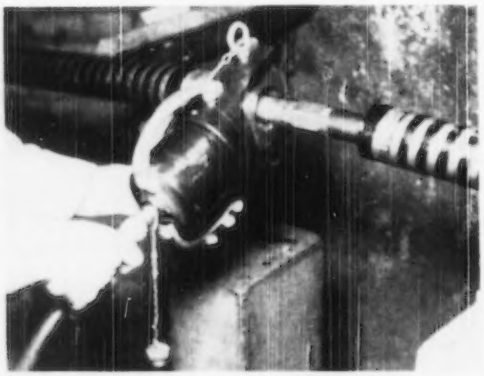
1 **READY FOR SPLICING,** the ends of a 1,500 Mcm conductor are separated to show how the conductors are cut



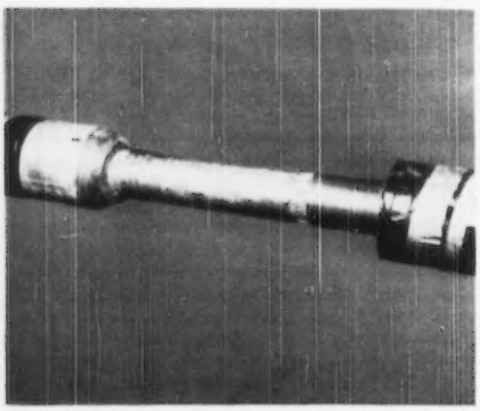
2 **CONNECTOR** is only slightly larger in size than the cable conductor. This was the first consideration in its development



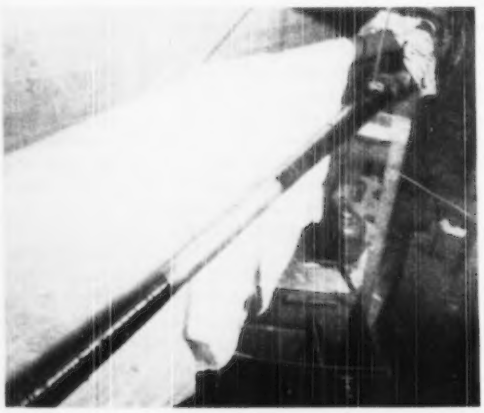
3 **HEXING DIES** are passed over the connector first. Other design factor was that joint should stand 10,000 lb pull for 7 days



4 **ROUNDING DIES** are next. This photograph shows the joint after the first pass of the rounding dies



5 **PRESSING** is completed after second pass of the rounding dies. More than 100 of these connectors are now in service



6 **SLEEVE IS SMOOTHED** to diameter 0.1 in. larger than conductor. Copper cones are applied at each end to finish joint

A Compression-Type Connector for Pipe-Type Gas-Filled Cables

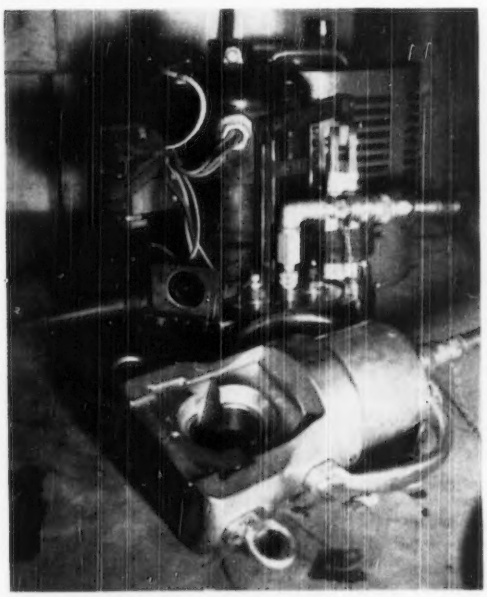
Compression connector for pipe-type gas-filled cable imparts extra mechanical strength required due to limited slack available for thermal contraction. Design results from failures on Detroit System

F. M. HULL, Cable Engineering Supervisor
The Detroit Edison Co, Detroit

DEVELOPMENT of a special compression type connector of greater mechanical strength was prompted by two mechanical failures of connectors in service on high-pressure, gas-filled, pipe-type cables on the Detroit Edison system. Engineers of the Detroit Edison Co worked closely with engineers of the connector manufacturer to produce the new connector.

Greater strength is made necessary in pipe-type cable joints by the limited slack available for thermal contraction when the cable is cooled below the temperature at which it was installed.

When plans were made for installation of a 1,500-Mcm segmental-type cable, several types of compression connectors were studied. First consideration was the contour of the conducting surface as it was desired that the connector should have, as near as was possible, the same diameter as the conductor. The second was that the joint should stand a tension load of at least 10,000 lb for 7 days (168 hr) without failure.



7 **40-TON PRESS** used in making connections is here seen with rounding dies in place. Electric hydraulic pump has cover off

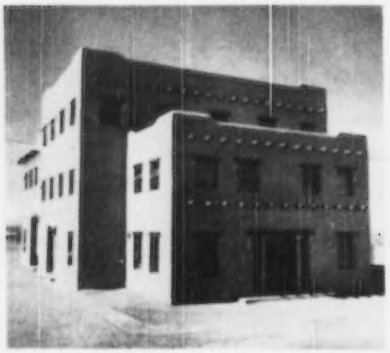
The connector developed was subjected to thorough going tests before actual installation in the line. Among these tests were 7-day loading tests at 10,000 lb both before and after the installed connector underwent heating and cooling cycles with temperatures reaching 110 C. There were no signs of slipping during these tests. The joint was then pulled to destruction, the first noticeable slip occurring at 23,500 lb, over double specified tension.

Steps in the construction of the connection are shown in Figures 1 to 6. The 40-ton hydraulic press and electric pump (with cover removed) are shown in Fig 7. Finishing operations provide a smooth surfaced connection 0.1 in. larger in diameter than the conductor, with a gentle slope from the connector to conductor surfaces. A layer of semi-conducting paper tape helps to provide an ideally smooth surface for the application of the insulating paper tapes.

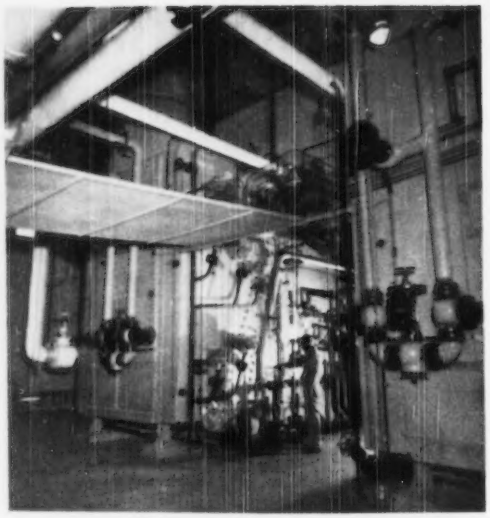
More than 100 of these connectors are now in service and it is anticipated that this number will be trebled in 1950 and 1951 when three additional lines of similar capacity will be placed in service.

First of the two failures in the 1941 line, which prompted development of the new connector, occurred when the cable was de-energized for a period of six weeks in February and March at the time the turbogenerator, to which it was attached, was given its first-year inspection and overhaul. The ground temperature at that time was about 10 C below the temperature at which the cable was originally spliced. This reduced temperature placed the joint under a tension calculated to be 1,200 lb.

Failure of the connector under this condition was due to the smaller load that can be carried by soldered joints over long periods because of cold flow, and to poor tinning of the conductor. The second failure was similar to the first and also occurred when the line was shut down during a period of low ground temperature. Subsequent tests indicated that the long-time breaking strength of the sweated connection did not provide sufficient margin over the apparent stresses experienced in the field to allow for variations in the sweating operation.



TRADITIONAL pueblo architecture of old Santa Fe was followed faithfully in the Public Service Co of New Mexico's new Santa Fe steam-electric generating plant. Combination of boilers burning fuel under pressure and keeping auxiliary power consumption to a minimum has resulted in a heat rate of 14,400 Btu per net kwhr distributed from the 6,000-kw unit. This figure was secured from the first full month's operation



COMPACTNESS, high rate of heat liberation, and excellent economy distinguish these boilers used in the Santa Fe plant. A forced draft, axial flow fan supplies air at 4 in. of water for combustion, giving heat liberation up to 150,000 Btu per cu ft per hr

Low Heat Rate for Small Plant

Santa Fe plant realizes 14,400 Btu per kwhr heat rate in first full month of operation. Eventual 12,000 kw to cost $145 per kw. Plant volume 20.3 cu ft per kw

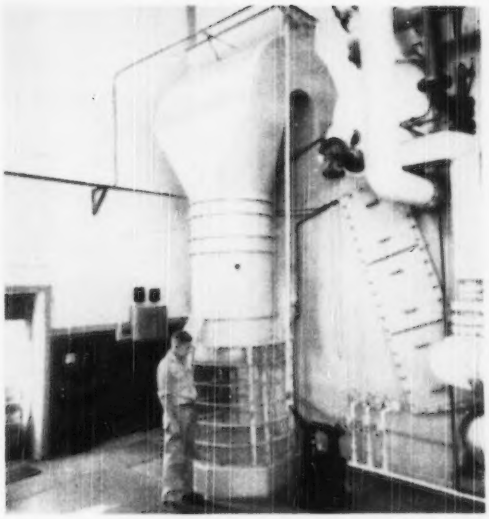
H. A. **PERSON,** Vice President and Chief Engineer
Public Service Co of New Mexico, Albuquerque

MARINE TYPE boilers burning gas or oil under positive pressure, and plant auxiliary power consumption of only 5% have enabled Public Service Co of New Mexico to realize a heat rate of 14,400 Btu per net kwhr distributed in its new 6,000-kw Santa Fe generating plant. Combustion under positive pressure of 4 in. water gauge gives heat liberation of the order of 150,000 Btu per cu ft per hr. Excellent performance and operating economy of the plant would indicate that modification of present design of land type boilers to burn fuel under such pressures might well secure better combustion conditions. At the same time, boiler first cost and space required are materially reduced by this higher Btu liberation per cu ft of furnace volume.

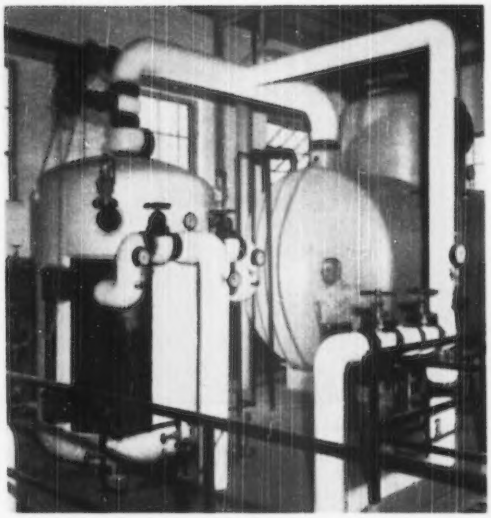
Availability Prime Factor . . . Rapid load growth at the end of 1948 in the Santa Fe area, which includes Los Alamos, required a substantial—and quick—increase in the company's generating capacity. New boilers were not available to meet the nine month shipment promised on a 6,000-kw, 400-psi, 750-F turbogenerator. Cost of second-hand boilers, including dismantling, shipment, and re-erection, was more than for new equipment. Therefore, when three new marine destroyer-escort boilers manufactured during the latter part of 1945 were located, they were purchased primarily because of their availability. Subsequent experience has shown that they might well have been chosen on the merit of their performance.

High Heat Liberation . . . Rated capacity of the boilers was set by the manufacturer at 60,000 lb per hr when oil fired. No information was available on their capacity with natural gas as fuel. The company's experience with the boilers indicates that by burning gas under the same furnace pressure of 4 in. wg, heat liberation in excess of 150,000 Btu per cu ft of furnace volume can be realized.

This heat liberation occurs without excessive furnace temperatures, and without indicating any CO. During tests the automatic combustion control was set for as little as 6%



LOW POWER CONSUMPTION of vertical axial flow F-D fan helps keep auxiliary load in the plant at a minimum. Two-speed motor requires 49 hp for maximum boiler rating of 45,000 lb per hr, and only 15-20 hp for loads up to 35,000 lb per hr per boiler



CONSTANT WATER LEVEL is maintained in the deaerating feed-water heater by varying makeup water to the evaporator. This eliminates continuous operation of either of the condensate transfer pumps, further decreasing auxiliary power consumption

Results from Pressure Combustion

excess air without producing CO. Because of wide variance in heat content of natural gas delivered to the burners, the control is normally set at 12% excess air. This gives an ample margin to burn the higher Btu gas, and still maintains air-gas ratio in proper proportion for lower Btu gas.

Forced Draft Fan . . . Positive pressure in the furnace is maintained by the axial flow forced draft fan shown, and no induced draft fan is needed. This reduces first costs and helps keep boiler auxiliary power to a minimum. Total auxiliary power required for the forced draft fan is only 49 hp at 45,000 lb per hr, arbitrarily chosen as the maximum operating condition required for each boiler. For the normal demand of 35,000 lb per hr and less, the two-speed motor driving the fan requires only 15 to 20 hp.

The two-speed fan motors are arranged so the automatic combustion control changes them from one speed to the other as steam generation requirements change. Elimination of the induced draft fan simplifies combustion control considerably. The control actuates a single damper to regulate the forced draft air to correspond with gas flow during gas firing, and air flow during oil firing.

Auxiliary Economies. . . To attain the best possible operating efficiency, all plant auxiliaries were designed for maximum operating economy. Two circulating water pumps serve the condenser. Either one can supply condenser water requirements for partial loads up to 4,000 kw. The induced draft cooling tower is equipped with two two-speed motor-driven fans, requiring 30 hp at full speed, 12 hp at low speed. Boiler feed pump is motor driven with a separate steam turbine pump as standby.

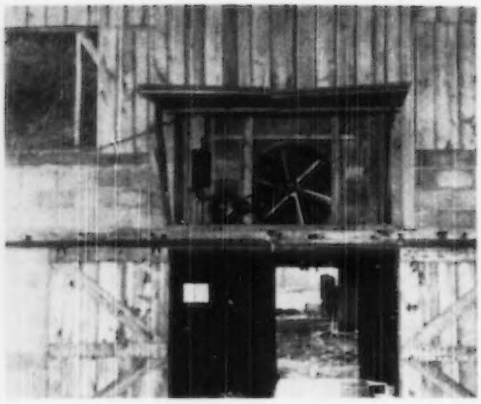
Constant Level in Deaerating Heater. . . Admission of steam from the raw water evaporator has been arranged to eliminate continuous operation of either of the condensate transfer pumps. By varying the makeup water to the evaporator a constant water level is maintained in the deaerating feed water heater. This effects a small saving in auxiliary power, and also maintains a continuous use and flow of vapor to the deaerator from the evaporator and the two extraction points on the turbine. Frequent variations in flows and temperatures are thus eliminated.

Instead of installing the condensate storage tank on the roof of the building or on steel structures, it is located on ground level outside the building at a considerable saving in cost of supporting steel and piping. Two condensate transfer pumps transfer condensate from storage to the deaerating heater when unusual quantities are required—for refilling a boiler, for example.

$173 per KW. . . Total cost of the plant, land, building and equipment was $1,040,000 or $173 per kw presently installed. Total capacity of the three boilers is sufficient for the 6,000-

(Continued on page 166)

"ONE STACK in the barn is worth three in the field", L. D. Morehead says from experience with his hay dryer



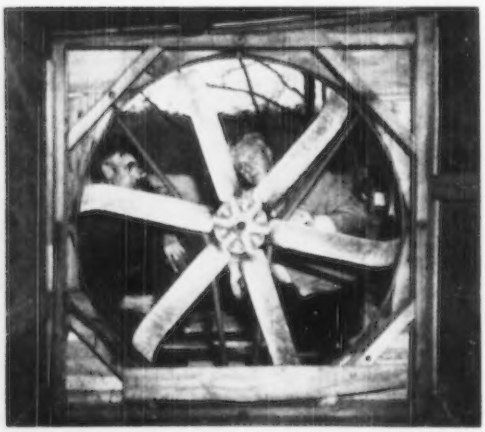
WITH THIS INSTALLATION farmer Morehead cured 55 tons of mixed alfalfa, clover and timothy at a cost of $23

Farmers in "Ole Virginny"

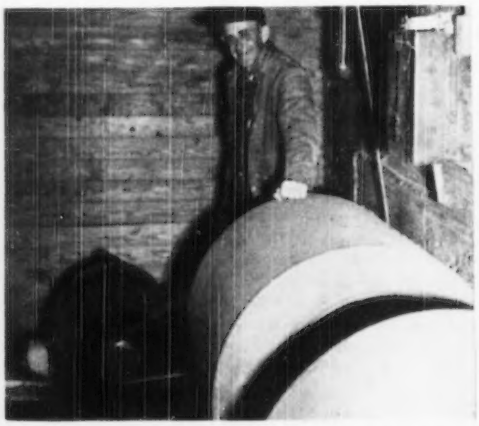
L. L. KOONTZ, System Rural Supervisor
Appalachian Electric Power Co, Roanoke, Va.

HAYING SEASON on farms in Virginia and West Virginia served by the Appalachian Electric Power Co ended this year with 315 dryers installed; 47 over the 268 at the end of the 1949 season. Horsepower of motors driving dryer fans rose from 1,772 to 2,080, an increase of 308.

Heaviest selling emphasis on hay dryers was in February because hay cutting time is May and June in the company's territory. Meetings with farmer groups, special advertising, success stories in local newspapers, conducted tours, radio plugs, all the means of creating desire, are used in February. This allows March and April to the agricultural engineers

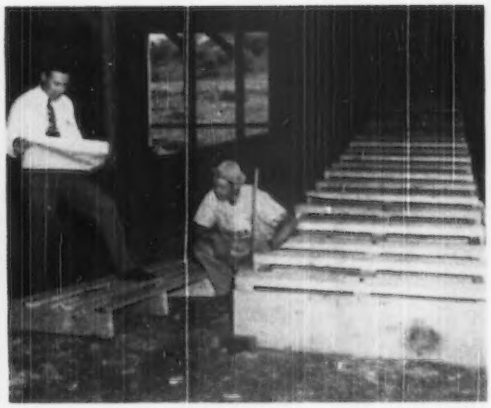


NARROW ESCAPE from fire due to improperly cured hay decided F. W. Sneed (left) to install dryer. With him is Rex Wilton, AEPCo



J. F. COPENHAVER beams approval. "For a dollar's worth of electricity, I increase the value of my hay $10 a ton", he says

DAIRYMAN E. C. CARSON shows D. A. Nickel, Jr, AEPCo, his mow cured hay. "My cows like it—produce 20% more milk", he says



ASSISTED by W. C. Buchanan, AEPCo. (left), J. R. Stone built his dryer for about $675. He finds it adds 25% to the value of his hay

Like the Electric Hay Dryer

of AEP Co for direct negotiation, design and supervision of new installations. The pictures on these pages are typical of installations and of publicity used in promotion.

The company introduced hay drying in its territory in 1940. Only a few installations were made each year until quite a while after the war when they began to increase rapidly. In 1949, 50 new installations were made, about the same number as were made this year.

Reason for the rapid increase in recent years is that farmers are now becoming convinced of the usefulness and versatility of the dryer. As first introduced, the dryer was considered only for the curing of long hay. Now its effectiveness in curing baled and chopped hay is coming into wider appreciation. Of the present 315 installations, 37 were used this year for baled hay and 26 for chopped. A number were used also for drying ear corn and other grain, one for curing onions.

HIGHEST BUTTERFAT COUNT—498.9 lb per cow—in his county is credited to his dryer by N. B. Flora

WEST VIRGINIA FARM of J. R. Stone. Barn at left contains the dryer he is shown building in picture at top of this page

DISTRIBUTION at 14.4/25 kv, multi-grounded wye has enabled REA-financed co-operatives to serve successfully such territory as this in Arizona and New Mexico. Doubling voltage has reduced cost to make systems economically feasible which could not have been served at the old 7.2/12.5 kv

RURAL CUSTOMERS in rugged country have been served satisfactorily at 14.4/25 kv up to 70 miles from the source. This typical pole arrangement shows 25-kv insulators and 3-kva transformer on lines of Mohave Electric Co-op, Inc, Arizona. Many REA-financed co-ops are using similar systems

LATERAL three-wire secondaries take off in both directions from this typical 1-ph line of the Navopache Electric Cooperative, Inc, Arizona. Double support on the primary and clevis-supported underbuilt secondary are standard REA construction, which requires few modifications for 14.4/25-kv operation

Southwest Co-ops Go to 14.4/25-kv

Cost per kw capacity less than 1/3 of 7.2/12.5 kv for rugged, sparsely-settled areas in Arizona and N. M.

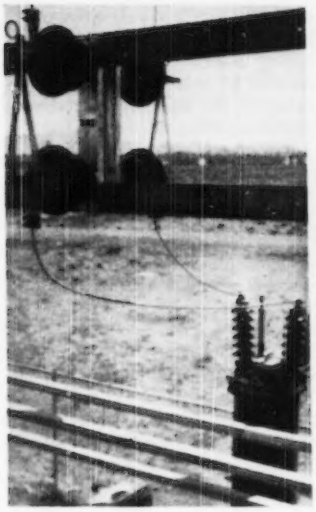
REX A. TYNES, Tynes and Loftin,
Phoenix, Arizona

EXPERIENCE in Arizona and New Mexico has established that REA line construction cost per kilowatt of capacity at 14.4/25 kv can be as low as 30% of the cost of construction at 7.2/12.5 kv for the same conductor size and phasing arrangement. With the increased voltage, service can be extended to many rural areas previously considered marginal or infeasible. Limitations on maximum length of line in some of the low consumer density areas is no longer governed by voltage regulation or economic conductor size, but instead by continuity of service. Rapidly increasing developments and improvements in sectionalizing devices, particularly oil circuit reclosers for use at this voltage, are expected to make even this problem less serious.

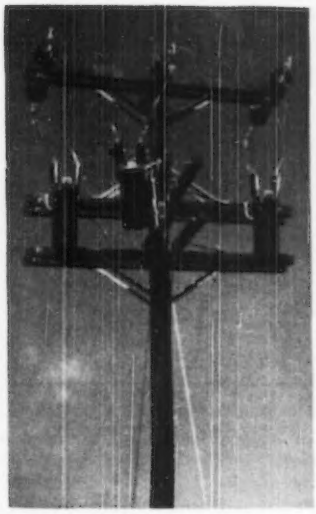
Following successful use of the higher voltage in the Southwest, some 43 REA-financed similar systems are in various stages of construction throughout the country. Four are energized and in operation, 15 are approved for construction, and 24 are in the planning stage.

First Construction 1948 . . . Construction of an REA-financed cooperative using a voltage double that of the standard system was started in the White Mountains in northeastern Arizona in 1948. The system was called the Navopache Electric Cooperative, Inc. and 145 miles of 14.4/25-kv multi-grounded Y line were built in 1948. An additional 98 miles were built in 1949, and 175 miles are planned for 1950.

Economic and social conditions in the area favored the system. Lumbering is the principal industry, but considerable ranching in open areas north of the forest land, farming in the valleys, particularly where water



OIL CIRCUIT RECLOSERS for use on 14.4/25-kv systems are now available from at least two manufacturers. Heavy lightning exposure coupled with high altitudes requires full protection by lightning arresters and reclosers for best continuity of service. Disconnects are standard 25-kv units



POLE MOUNTING is also satisfactory for oil circuit reclosers. Three-phase reclosers for operation at the higher voltage are not yet available, but probably will be within the next year. This area has an isoceraunic level of about 45. Excellent protection has been furnished by standard 18-kv arresters

Distribution System

is available, and a thriving tourist and vacationist trade give the area a diversified income. Geographical conditions also favored the higher voltage system and at the same time offered an opportunity to test it under service conditions (long distances, heavy lightning exposure, high altitude) about as severe as would normally be encountered any place in the U.S.

Farmers and ranchers of the area are located along streams or where water is available and where the terrain provides protection from the weather. Population distribution is therefore different from the usual REA system, where there is a consumer every half or three quarters of a mile. In this area there are small settlements of a dozen or more dwellings spaced six to ten miles apart, with none in between.

In some cases it is possible to locate a single transformer to serve as many as eight or ten dwellings at these small concentrations of population. Number of transformers on the system in these areas averages approximately one per mile of line, even though membership density is considerably greater (see box below).

Second project to use the higher voltage in Arizona was the Mohave Electric Cooperative, Inc, Kingman, Ariz. The area to be served by one 3-ph trunk line extending approximately 50 miles from source was mostly open country, with some canyons. Approximately 150 hp of irrigation load 20 miles from the source and a small town 50 miles from the source were the major loads. The town appeared destined to become a railhead and building center for reclamation developments in the area, and future extension of a line from the town approximately 15 miles to serve some vacation resorts, ranches and a possible 300-hp lime and cement mill were additional considerations.

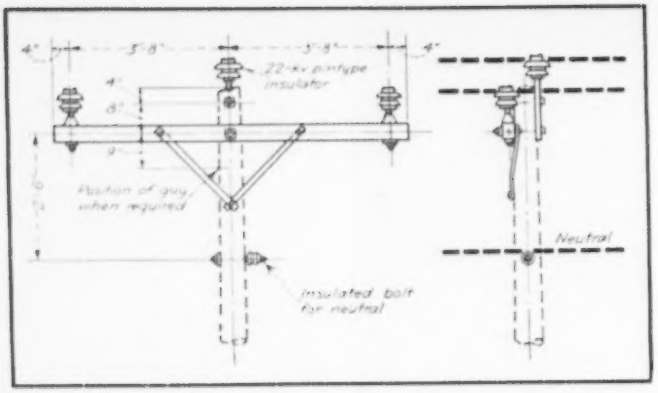
Vital Statistics on 14.4/25-kv System Of Navopache Electric Co-op

Miles of line	145
Consumers	517
Transformers	158
Consumers per mile	3.5
Consumers per transformer	3.3
Transformers per mile	1.1

Comparative Costs . . . The emphasis on savings in transformer costs which could be one important deciding factor under these conditions of concentrated populations is becoming less significant as transformer prices decrease. Price of a 3-kva distribution transformer for the 14.4/25-kv rating has decreased from about $200 to about $120 since April of 1948. With this substantial decrease, the cost of a 14.4/25-kv system is only a small percentage (possibly 10 to 25%), more than an equivalent 7.2/12.5-kv line, assuming the same size conductor and phasing. Yet the line capacity is quadrupled, making the construction cost per kilowatt of capacity at 14.4/25-kv approximately 30% of a 7.2/12.5-kv line of the same conductor size and phasing arrangement. Actual costs of construction vary widely with terrain and load density, but generally have been in the range of $800 to $1,200 per mile for single-phase line and $1,500 to $2,000 per mile for 3-ph line.

Increased Loads, Greater Distances . . . Two factors dictated the need for a higher distribution voltage on REA systems such as these. Consumer loads increased to an unprecedented 200-400 kwhr per month, and many cooperatives had to extend their lines relatively long distances from their power source. The original design voltage of 7.2/12.5 kv was satisfactory for lines as long as 30 miles from the power source, with average consumption of 100 or even 200 kwhr per month. Longer extensions and higher consumption rates posed a problem of load growth which was met by installing voltage regulators, re-phasing lines, and increasing conductor size.

There is a limit, however, to the accomplishment of each of these



MINOR MODIFICATIONS of REA standards make a structure suitable for 14.4/24.9 kv. This is a single primary support for three-phase, four-wire star, for angles up to five deg

methods. Only a certain number of regulators can be cascaded; 1-ph lines can be made vee-phase and finally 3-ph, but after that not much can be done except for installation of double circuits in some cases. There is also an economic limit to increasing conductor size, for with a long lightly-loaded line increasing conductor size accomplishes very little, since it reduces reactance only a small amount.

Design Problems . . . Increased clearances, line insulation, transformer costs, protection equipment, and in some cases the added problem of operating at high altitudes have been important design problems for these higher voltage systems.

The National Electrical Safety Code permits the same ground clearances for 1-ph sections of 14.4/25-kv systems as are normally maintained on 7.2/12.5-kv. An additional two feet of ground clearance is required on multi-phase sections and in practice this added clearance is ordinarily provided for 1-ph sections. This saves in the long run, since experience has shown that they will often be converted to 3-ph lines.

On deadends two 10-in. or three 6-in. disc insulators have been used. Experience has not yet shown which is to be preferred. There appears to be a definite need for additional spacing at deadends, particularly on three-phase systems. Since the three 6-in. disc insulators provide some increased separation from conductor-deadend to pole, they seem to offer a slight advantage. Use of extended type deadends of either 7.2/12.5-kv or 14.4/25-kv class, now rapidly coming into use on REA-financed systems, may overcome this obstacle.

Pin insulators of 65/95 kv wet/dry flashover are used instead of 35/65 kv wet/dry flashover insulators normally used on 7.2/12.5-kv systems. In the Navopache system with some elevations over 7,000 ft, some insulators having 70/110 kv wet/dry flashover are used.

Most manufacturers are now producing transformers for use at the higher voltage. Insulation levels run from 15 kv to 25 kv, with most manufacturers appearing to favor a voltage level intermediate between these extremes. As mentioned before, difference in price for the higher voltage class has shown a marked decrease in the past two years. Oil circuit reclosers for these systems can be had from at least two manufacturers.

Heavy lightning exposure in the area, which has an isoceraunic level of approximately 15, requires complete protection of the lines with lightning arresters. Standard 18-kv arresters have been used, and have given excellent protection.

High Ground Resistance . . . High ground resistance is another factor contributing to the difficulty of maintaining satisfactory service at the higher voltage. The White Mountains are volcanic in origin, and a large amount of volcanic ash has been spread for many miles over the countryside. In many cases the volcanic ash and deposits go considerably deeper than normal pole setting.

Emphasis was placed on obtaining as satisfactory ground conditions as possible to reduce neutral shift, because of the transformer insulation problem. Wrapped coil, plate, or driven ground rods were provided on every pole of the Navopache system. Spot checks on ground resistance for individual poles showed a wide variation at different locations (50 ohms to 1,000 ohms), largely because of the unpredictable characteristics of these volcanic ash deposits. Where ground resistance was exceedingly high, additional rods were installed to improve grounding conditions. This was considered imperative for the first section of construction, where 13.8-kv transformers of 15-kv insulation class were used.

Safety Considerations . . . Existing operations and safety recommendations which REA provides its borrowers are applicable with some revision to this doubled voltage. In general, linemen are encouraged to de-energize lines and place protective grounds within sight in both directions from the location where they are working. Where hot line work is required, however, linemen are operating energized lines with hot stick equipment. There have been some isolated cases of accidents on systems employing this voltage, but all reports indicate that these accidents would probably have occurred had the systems been designed and operated at 7.2/12.5 kv. In one or two cases an accident occurred which it is believed could well have proved fatal regardless of voltage had the increased clearance required for 14.4/25 kv not been present and the worker contacted the primary conductor.

Others Will Follow . . . Doubling the rural distribution voltage is perhaps the outstanding development in distribution engineering during the past several years. Considerable savings are being realized by appreciable reduction of conductor sizes where the higher voltage is used in areas of higher consumer density. In other cases the increased voltage has permitted elimination of double circuit construction, multi-phase lines and even some elimination of substations and high voltage transmission lines.

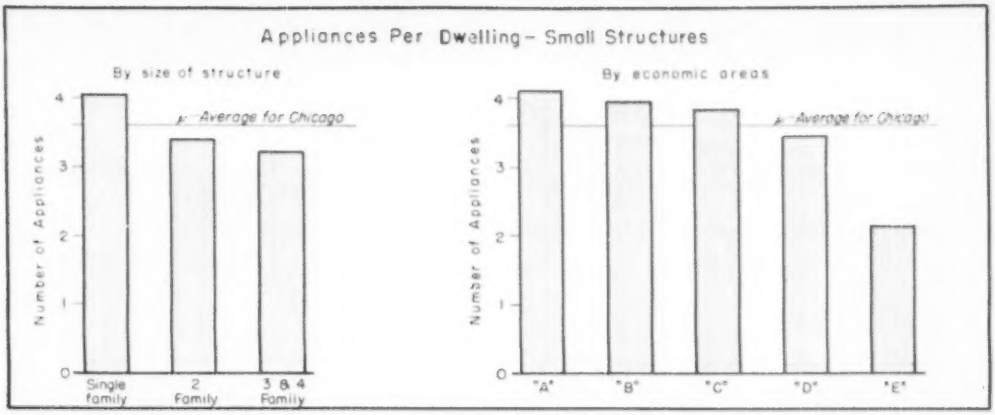


FIG 1—AVERAGE APPLIANCES PER DWELLING unit in one, two and three family structures, exclusive of ranges, was 3.7. By economic areas the average was 4.08 for highest income homes and 2.09 for lowest income homes, exclusive of ranges

The Residential Appliance Market—What Is It?

It is one thing if ultimate user is buying, another if the building owner is buying for tenant usage. The author reveals results of a survey made of both markets

JOHN B. WATKINS, Sales Research Analyst
Commonwealth Edison Co, Chicago

A RECENT STUDY of the Chicago residential market shows that the trend toward multi-unit housing, with building owners furnishing much of the major household equipment has resulted in two residential markets for electrical equipment and electric service: the user-buyer market and the building owner market.

Effect of Economic Level . . . Monthly kilowatthour consumption of residential customers by meter districts was compared, in the Chicago study, with a five-level rental classification used by the City. This comparison showed a close correlation between electrical usage and rental levels. Assigning an index number of one to the mid-rental group, the variation in monthly kilowatthour consumption, between the five rental level areas, was found to be as 1.2: 1.06:1.0:0.9:0.7.

This distribution was not because the upper rental level is composed primarily of large mansions. There are comparatively few large mansions or apartments left within the city. However, existing residential customers must be classified according to their potential buying power, before the practical limits of the existing market can be determined. Not considered in such a classification are the very lowest-cost items such as flat irons, small radios and the less expensive portable lamps; also the higher priced equipment, such as the refrigerator, which customers consider a necessity in the modern household.

Since utilities are interested in pushing major appliances costing $100 or more installed, the amount of money customers have to spend is important. From the latest statistics available it appears that in Chicago 70% of all families have an annual income of $3,000 or more. Studies show that families with this income are likely to have $100 or more to spend at one time.

How family financial capability affects the number of major appliances in the home is shown in Fig 1. This chart does not include ranges. The highest income class homes (A) had an average of 4.08 major appliances, the lowest income 2.09; almost a 50% variation.

Effect Of Dwelling Size . . . Use of some appliances, such as washing machines and automatic water heaters, reflects to a marked degree the effect of size and type of dwelling unit. Small dwelling units mean smaller families, either married couples without children at home, or "artificial" families where both persons are frequently employed. In many of these cases more personal services such as laundry service and meals are pur-

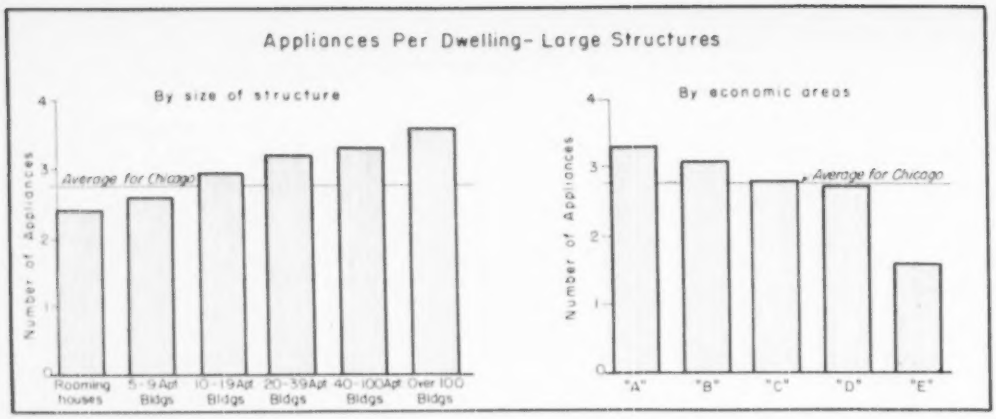


FIG 2—IN LARGE BUILDINGS there were only 2.7 appliances per dwelling unit, exclusive of ranges, compared to 3.7 in smaller buildings. Average in large buildings in better economic areas was 3.2 appliances, but only 1.6 in the poorest economic area

chased outside the home.

Washing machine saturation showed a positive correlation to size and type of dwelling unit, but when measured on an economic basis reflected living habits in that the upper class homes, particularly those in apartment buildings, are prone to send their laundry out rather than do it at home.

Electric water heater saturation, too, reflects the size and type of dwelling unit and structure in which located, but for different reasons. Where electric water heater is the storage type operating on an off-peak rate, its use is restricted to single-family homes, or at most two or three-family units. The maximum theoretical market therefore is limited to 110% to 120% of the number of such structures. The portion over 100% is attributable to small structures where each dwelling unit has its own water heater.

Saturation of home freezers is low in Chicago and confined almost entirely to single-family and two-family dwellings. Lack of space for individual freezers in larger buildings accounts in part for this trend. But it was found that while only 2.5% of the people surveyed had any interest in acquiring a freezer, approximately 25% were interested in a combination home freezer-standard refrigerator machine now on the market.

Effect of Dwelling Ownership . . . What building-owned equipment means to the residential market is that a relatively small number of building owners are being substituted for a very much larger number of individual families as buyers.

In Chicago more than half of all families live in buildings of five apartments or more; 77% live in rented premises. The types of equipment furnished by building owners is the dominant factor today in the residential market in Chicago.

Most buildings from the median rental level upward provide ranges, refrigerators, hot water heating and central heating equipment for tenants regardless of whether they are centrally or individually metered. From the median rental level downward fewer and fewer building owners provide any of these items of equipment, except possibly the kitchen stove. In the lowest rental level, a very high percentage of buildings furnish neither hot water, nor central heat. None furnish refrigeration. In these buildings any modern equipment is furnished by the tenants for their own comfort and convenience. This market will be extremely limited because of economic conditions.

In Large Structures . . . Fig 2 gives an over-all picture of major appliances in larger structures. Rooming houses have been included in this picture because: (1) They are on commercial rates in Chicago, (2) they include many so-called light-housekeeping apartments. These have only partial cooking facilities, but house the equivalent of two or more family or spending units. Structurally speaking they are of two types: (1) Old single dwellings, (2) large apartments in old buildings originally erected in a good neighborhood that has since deteriorated. As a class they are at the bottom of the list, electrically speaking, of any type or size of structure or dwelling unit, regardless of the economic level of the neighborhood.

Next lowest level, electrically speaking, is the 5-9 apartment building regardless of the economic area in which it is located. Most of the 5-9 apartment buildings are in middle or lower rental areas. In general, owners of these buildings provide kitchen stoves, and in the better class neighborhoods, central heating and water heating facilities. In the poorer class neighborhoods there is still a very high percentage of stove-heated apartments without any water heating facilities of any kind.

Building-owned refrigeration is less frequently provided in the 5-9 apartment size than in larger buildings. Comparatively low rentals charged in the poorer class neighborhoods do not permit the presence of building-owned equipment. The size of the dwelling units in such structure generally averages five to six rooms, with some even larger and in the better-class neighborhoods the people are prepared to buy their own refrigerators and laundry equipment, expecting only to be furnished with central heat, hot water, and a cook stove.

(Continued on page 166)

Multiple vs Series Street Lighting

I—SYSTEM PRINCIPLES ANALYZED

A comparative analysis of the two basic distribution systems for street lighting in which the author points out the design significance of their advantages and limitations

K. DOUGLAS TOBIN, Lighting Sales Division, General Electric Co, Lynn, Mass.

A STRAIGHT DOLLAR comparison of both multiple and series-operated street lighting systems, including the intangible factors, will give operating engineers an answer as to how to spend the fewest dollars for the greatest number of sufficiently lighted streets. As a background for making such comparisons, factors that influence the selection of either system are outlined here. Economic evaluations of the systems will be presented in an ensuing issue.

Following paragraphs provide an analysis of the principles underlying the distribution of power to both the multiple and series lamps. Characteristics of the circuits and their elements will be examined. Advantages and applications of series and multiple lamps will be compared. Also included is a resume of mercury lamp operation. Results of a survey are summarized later in this article that indicate a trend to multiple distribution systems.

Multiple vs Series . . . How the Advantages Compare

Multiple System	Series System
1. Lower cost lamps which are easier to replace.	1. A more efficient lamp.
2. Safer operating voltages not requiring the use of "hot-stick" linemen.	2. More rugged lamp.
3. No third circuit to overlap existing lines.	3. Lamp maintains its initial lumen output more faithfully.
4. Easier to locate faults and more rapid recovery of service after disasters.	4. Past performance—reliability in operation.
5. Better utilization of pole and cross-arm space.	5. Line crews are thoroughly familiar with characteristics.
6. Susceptibility to "hot crosses" minimized.	6. Ease and simplicity of control.
7. Greater flexibility in the case of a few lamps.	7. Independence of series circuit.
8. Lower critical losses.	8. No subjection to secondary distribution disturbances.
	9. Applies itself well to remote locations which have no secondary distribution.

Lamp Characteristics Compared . . . Multiple street lamp characteristics differ materially from series lamps with regard to operation in a given circuit. The difference will be observed in accompanying typical curves of the lamps.

For multiple operated lamps, (Fig 1A), the lumen output falls off gradually throughout the life of the lamp. At 70% laboratory-rated life, the normal replacement period, the lumens fall to approximately 84% of the initial value. Furthermore, the efficiency—light output for watts input—falls approximately 11%. This is tempered somewhat by the fact that watts consumed drop about 4%.

Series lamps (Fig 1B) have a much flatter characteristic. At about 70% of laboratory-rated life, lumen output drops only 1% after having increased 2 or 3% during its burning time. As this occurs, lamp efficiency drops only 4% compared to 11% for multiple lamps. True, the watts have increased 2 or 3%, but lumen output is nearly the same as when the lamp was first installed.

Why does this happen? First, throughout the life of a multiple lamp, there is a definite amount of evaporation of the tungsten filament. With a constant voltage impressed upon an ever increasing resistance, the resultant current flow is diminished. Thus, the I^2R (heat) factor, which in turn generates the visible light energy, decreases by the square of the current flowing. This coupled with the bulb-blackening factor from tungsten condensate, results in a lower light output from the particular lamp in question.

The case of the series lamp is different. Here again filament evaporates, resistance increases, but the current remains constant. Therefore, the I^2R (heat) factor will increase somewhat during the life of the lamp. Accordingly the lumen output will remain practically constant until bulb-blackening becomes the influential factor.

Lamp Operation . . . . Consider multiple lamps operating at rated

An adaptation from author's paper entitled "Present Day Economics of Series vs Multiple for Street Lighting Service" presented before the Power Distribution Conference at University of Texas, Austin, Texas.

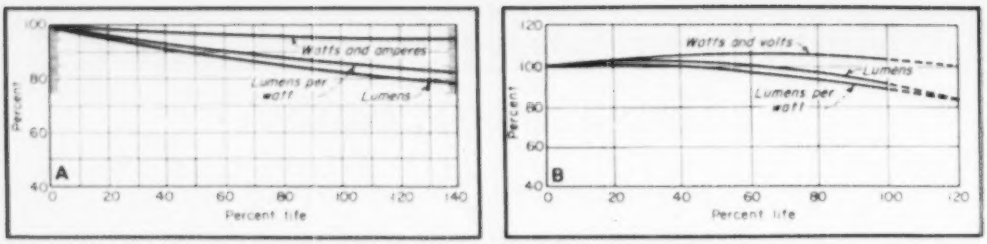


FIG 1—**EFFECT OF AGE** on the output, power consumption and efficiency of (A) multiple operated and (B) series operated street lamps

120 v. Output changes as this applied voltage fluctuates between the allowable limits of an average secondary distribution system. Take for example the limits plus 2% and minus 3%. Referring to Fig 2A, the lumen output curve has a steep slope; approximately a 3% change in lumens for each 1% change in line voltage. Thus, within these limits, the lumen output will vary between 91 and 106% of normal. Also the efficiency varies between 93 and 104% and the power consumed varies between 96 and 103% normal watts. Actually, an operator fares better with the plus percentage because of better efficiency and more light on the street.

For series lamps the fluctuations from normal current are considerably more detrimental to operation of the circuit than voltage variations on the multiple system. From characteristic curves in Fig 2B, 1% change in current shows approximately 7% change in light output; this with about 3.5% change in efficiency and nearly 3% change in watts.

These figures are important to remember. The first reaction will probably be that conditions are more favorable to operation of multiple lamps. But the regulations on the two systems must be considered. The moving coil type of constant-current transformer regulates the secondary current to less than 1% from no-load to full-load, while the primary voltage applied may vary as much as 5%. And once a given load point is reached, the current will remain constant as long as this 5% is not exceeded. In comparing this condition to the best regulated multiple system, the series system has the advantage.

Cost of Lamps . . . Foremost lamp advantage to multiple operation is the cost. Multiple lamps have a price less than the series lamps, and they are easier to replace from the standpoint of handling sockets. However, this lamp is not as rugged as the series lamp and will not provide the fine lumen characteristic which is so typical of the series lamp.

Multiple Circuit Advantage . . . A safety factor in using the multiple system is low-voltage operation. Most systems operate at either 120 v, 2-wire or 240 v, 3-wire, and some at 120-208 v, 4-wire. Low voltage is an advantage to operating utilities because of the need for workmen with less skill and experience. It is also an advantage to the citizens of the community because they are not subjected to high voltage in case of accidental exposure.

Another advantage of the multiple system: With the exception of rural areas, highways, and arterials, practically all other street lighting is installed in either residential or commercial sections of the community where low-voltage secondary distribution exists. In other words, there is a duplication or overlapping of circuits if a special street lighting system, such as series, is installed. Power for street lighting is available from existing secondary service. This fact alone means lower installation costs laborwise and less susceptibility to large-scale outages. In the case of large-scale disaster outages, street lighting service is replaced at the same time as all other services. No backtracking is required to isolate opens on long looping circuits. Greatest advantage here is that small increments of load reduce the possibility of having large areas without light for prolonged periods of time.

Referring again to low-voltage circuits, the space occupied by street lighting wires is down at the secondary level, not on the top arm. This is important where higher primary distribution voltages are used thus requiring greater spacing of the primary feeders on the top arm. Furthermore, spans between poles need less tree and foliage clearance because of fewer wires. Add to this feature the fact that repairmen and maintenance crews need not go up into the primary area where "hot-stick" linemen must work with special equipment. This factor reduces labor costs, and with present day labor charges, the greatest single saving in installing and maintaining any system will be in reducing the labor cost.

A further advantage of operating at this secondary voltage level is that lamp burnouts due to so-called "hot-crosses," that is, series circuit entangling with primary distribution feeder, will be greatly reduced. The physical separation of the two systems is the primary reason.

Flexibility of Installation . . . Conditions of each installation must be weighed. Take for example street lighting in a rather remote section, but where a sizable load is anticipated in the vicinity of and for a specific location. This load will be principally residential. At isolated locations throughout the area, it is decided to install adequate street lighting. In this particular case multiple lighting would probably be installed and operated by individual controls such as photoelectric heads. At some later date, if it is desired, the units may be incorporated into a large scale system.

On the other hand, take the case of a new development—either residential or commercial—at the fringe or outer edge of the community. Quite possibly a series circuit will be near by, and just a few lamps can

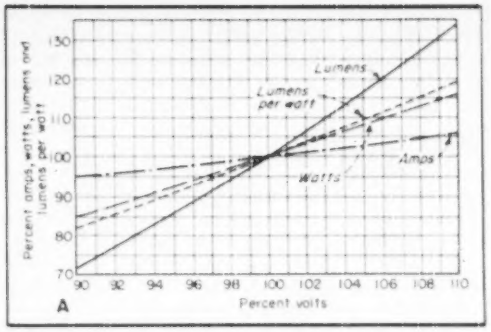


FIG 2A—PERFORMANCE CHARACTERISTICS of multiple street lamps show output changing with applied distribution voltage

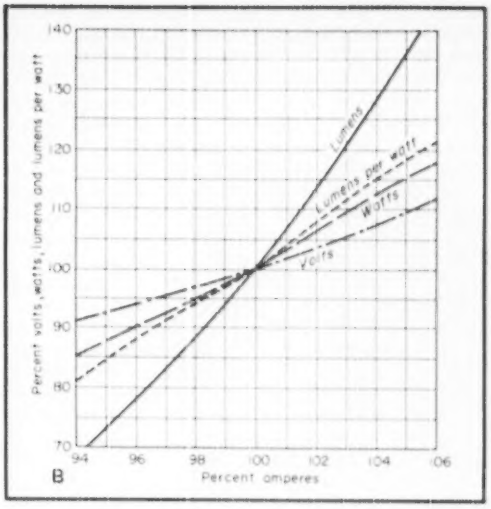


FIG 2B—SERIES STREET LIGHTING SYSTEM current fluctuations are more harmful than voltage changes on multiple system

be installed conveniently by extending the series circuit a short distance. The transformer will undoubtedly have the necessary capacity, but if not, the chances are adjacent circuits may be recut to allow for the additional load. At some future date if more intense lighting is demanded or the load becomes more dense, it means only installing the necessary transformers and a control device.

Those are only two specific examples. The final analysis of the more general case where one or two lamps are to be installed will show that multiple operation is the more flexible of the two systems in question.

Lighting System Losses . . . Losses in a system are generally twofold—heat and wattless. The series system, in general operating at higher currents, has a higher I^2R loss than the comparable multiple system with constant voltage and larger copper sizes. This is counteracted to some extent by the series lamps giving more lumens per watt.

As to the wattless loss, the series transformer is inherently a lower power-factor device and depends on this characteristic for its operation. Thus, without corrective capacity in the form of capacitors, the street lighting service will tend to lower the system power factor. Low power factor loads are not a serious problem unless: (a) Generating capacity is near maximum, (b) load to be fed demands power at the same time as system peak. Except for some winter days the streetlighting load does not create much of a problem for the evening peak. In fact, when this peak is passed, the system load factor will be improved. Details of specific losses and their effect on the economic choice of a system will be discussed at greater length in Part II in ELECTRICAL WORLD of Nov. 6.

In the future more and more minimum power factor clauses will undoubtedly be incorporated in rate contracts. If this is the case, multiple, with its better over-all power factor, will have the edge on series with its corrective devices.

Series Circuit Advantages . . . Series circuit operation is the next phase to be considered under comparative cost advantages of each system. Lamp operation has already been discussed. However, the series lamp has certain advantages over the comparable multiple lamp such as:

1. Ruggedness—a stronger filament.

2. Higher efficiency—more lumens per watt.

3. Better lumens maintenance—throughout life.

These factors are important in determining the number of lumens on the street for each dollar from Mr. Taxpayer.

Line crews are familiar with series circuits and their performance. Series circuits originated with the old arc lamp system. Consequently, the more experienced linemen know well how to maintain the "loops" and shoot trouble on high-voltage lines. Past performance of these circuits has been favorable. They are simple to control and do an excellent lighting job. Reliability has been a major factor in the preservation of series lighting circuits. The power supplied to the lamp is well regulated and, consequently, gives the high caliber lighting which is so vitally important to the saving of lives and providing the motorist with more night-time driving ease, or "comfortable seeing."

Ease of Control . . . Probably the most influential factor in the adoption of series circuits is the ease of control. Primary power is taken off at only a few locations and controlled from these same few locations. Thus, for any given circuit, say 20 kw of installed load, the series circuit offers one set of control devices to purchase and one location to maintain. Whereas, this same amount of multiple load would have anywhere from several units up to 40 or 50 depending on lamp sizes and type of control used. The series control unit has no limitation directly related to the size of lamps. There is no additional wiring necessary between lighting units for control purposes. And finally there are fewer lo-

rations where trouble might occur. Recalling when blackout conditions prevailed, imagine the confusion if the street lighting had been multiple rather than series in the proportion of 90 and 10%. Emergency blackouts would have been next to impossible without disrupting a good part of the residential and commercial service at the same time. Granted, a pilot wire, either straight or cascade, but originating at some central location, overcomes this difficulty. But this becomes a form of series control.

Another advantage of a series system is that it is an independent circuit, and is tied into the primary at only a few widely-separated locations. Being an independent system it is not subject to the disturbances which are characteristic of the low-voltage secondary distribution system.

Series Circuit Application . . . Where is the series circuit favorable? The first answer, is where there are no convenient secondary distribution lines. Parkways, highways, and arterials, fall into this category. Other applications are perimeter lighting such as war plants used, also runway lighting of airports where the amount of light is so important and where it will change with varying conditions of visibility.

A practice which is becoming acceptable is the application of single-wire, overhead construction to downtown areas. A single bare wire is strung from pole top to pole top and thus lost to the eye for all practical purposes. Some reasons for this trend apparently are the increased demands for downtown ornamentals, and by stringing overhead wire the labor charge is only a fraction of what it would be to put this same installation underground. So again this problem of high labor costs influences the type of system installed.

Mercury Lighting . . . This form of lighting is a subject all its own and the intent here is merely to acknowledge the definite trend of this efficient light source and not to make a complete analysis of this one phase of series vs multiple. Fluorescent is still in its infancy but it does have many favorable characteristics. Extensive mercury-vapor lamp operation experience is quite limited and data is available from only a few sources. However, indications are that better operation and longer lamp life are being found on the series circuits rather than the multiple. On the other hand, as will be seen later, the economics of installing mercury are somewhat in favor of multiple. And it is interesting to note the 16,000-lm mercury lamp has an annual cost comparable to the 10,000-lm filament lamp.

Reasons for the better electrical operation on series circuits seem to be threefold. First, by using the moving coil type of regulator, the free movement of these coils acts to damp out and cushion the effect of line surges. Thus, only a small portion of a surge is passed along to the series circuit or secondary of the transformer.

Second factor is the better over-all voltage control on the lamp. The series circuit is not exposed to such fluctuations as occur on the secondary distribution lines. In the case of a business section, where considerable mercury lighting is being installed, stresses are put on a multiple system when the load begins to fluctuate radically. When the evening peak approaches the voltage dips to its lower limit.

The third factor is that it is just about impossible to overwattage and thus overvoltage a mercury lamp and ballast from a series source. This is due to the nature of the constant-current transformer and its ideal regulation, plus the general characteristics of the series circuit. The same may be said for undervoltage operation—it is next to impossible. This is very important because the characteristic of any vapor lamp is sensitive to undervoltage operation. When the voltage falls below a specific value, the arc is extinguished and restarting must take place.

The slight advantage which the multiple system holds on installation and operating costs, is due mainly to the additional transformer capacity which is required and slightly higher secondary losses.

The mercury lamp question can thus be summed up with the following: Indications are that better mercury operation is being obtained from series circuits, which is apparently due to the better regulating characteristics of the moving coil type of series transformer. Installationwise the multiple operation has a slight advantage since the additional capacity necessary for starting is usually available whereas the series capacity must be made available in the form of constant current transformers.

Results of a Survey . . . An extensive survey concerning series vs multiple street lighting was undertaken by the Lighting Division of General Electric Co. Replies from numerous utility and municipal organizations throughout the country reveal that some very serious thinking is being conducted along multiple lines. Reasons which have been outlined in this discussion are the foremost factors for this thinking. In addition, the following points seem to be influential:

1. Increased primary distribution voltages. From existing 2,400 v increased to as high as 13.2 kv. This demands more clearance on crossarms and more tree trimming.

2. Recutting series circuits for expansion sometimes becomes quite involved because of voltage limitations.

3. Low voltage is safer from the standpoint of maintenance crews and citizens alike.

4. General practice indicates that distribution transformers can be overloaded during short peak periods without damage. Thus, additional transformer capacity is not required.

5. Attractive rate structures have been offered by some of the larger utilities.

6. High labor costs are influential today. The cost of installing and maintaining any circuit is perhaps 60-75% labor. Therefore, any reduction which can be made in labor costs affects the whole cost materially. Multiple distribution seems to show the biggest saving in this respect.

7. Individual control of lamps, with the recent development of photoelectric devices, decreases installation and maintenance charges. This coupled with the fact that the lights come on when actually needed, shows a bright future for this device.

The situation of so many favorable conditions for multiple operation is not alarming. Most of this multiple circuit consideration is in new developments where no street lighting

(*Continued on page 168*)

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FUSE CUTOUTS

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YET IT COSTS NO MORE THAN ITS 50-AMP PREDECESSOR

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- **POSITIVE INDICATION** of blown fuse is given by a double spring-operated indicator arm.
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Cutout door without fuse link

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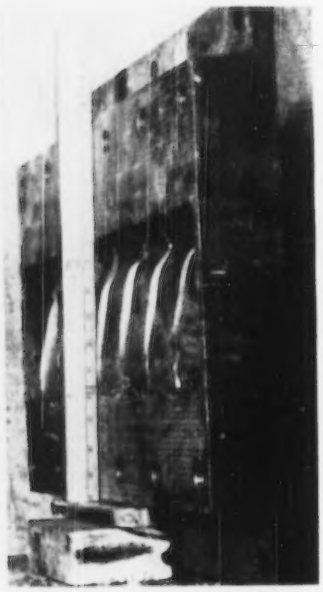
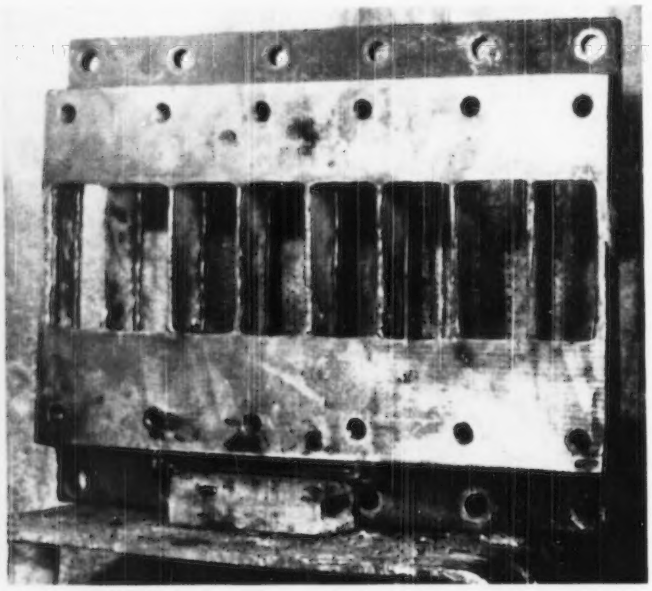
GENERAL ELECTRIC

406-37

HOW TO DESIGN • CONSTRUCT OPERATE • MAINTAIN



BEFORE RECLAIMING . . . partitions on riffle castings were badly eroded



AFTER RECLAIMING . . . partitions were built up and hard surfaced by use of chrome-molybdenum, nickel-iron alloy electrodes. Reclaimed castings last three years

Save 92% of First Cost by Reclaiming Riffle Castings

A. L. SMITH*
Boiler Maintenance Foreman

R. M. BURCKHOLTER
and
BROOKS BLAKE
Boiler Maintenance Dept
The Ohio Power Co
Philo, Ohio

A 92% saving in original cost of coal-burner riffle castings is anticipated by use of arc welding to build up eroded partitions and thereby reclaim the castings.

It was found that after about two years service partition plates became so badly eroded by the low-grindability coal that they had to be renewed. Each of four boilers at Philo Plant are equipped with six castings. Four sets of renewal castings were bought for about $3,665, or an average of $1,833 per year of service.

Consequently, after the first purchase, it was decided to try reclaiming the riffle castings as only partition plates were worn. It was found that partitions could be built up and then hard-surfaced on the top side by arc welding, using ⅛-in. hard-facing electrodes composed of a chrome-molybdenum, nickle-iron alloy.

Life Extended 100% at Cost of 12%

The reclamation, including hard-surfacing, was done at a cost of $17.75 per casting, or $426 for four boiler sets composed of 24 castings. This is less than 12% of the cost of new castings. With a service life of two years (the same as the original castings), the net over-all saving of reclamation instead of buying new riffle castings will be $3,240 for 24 replacements, averaging $1,620 yearly.

Resulting Savings

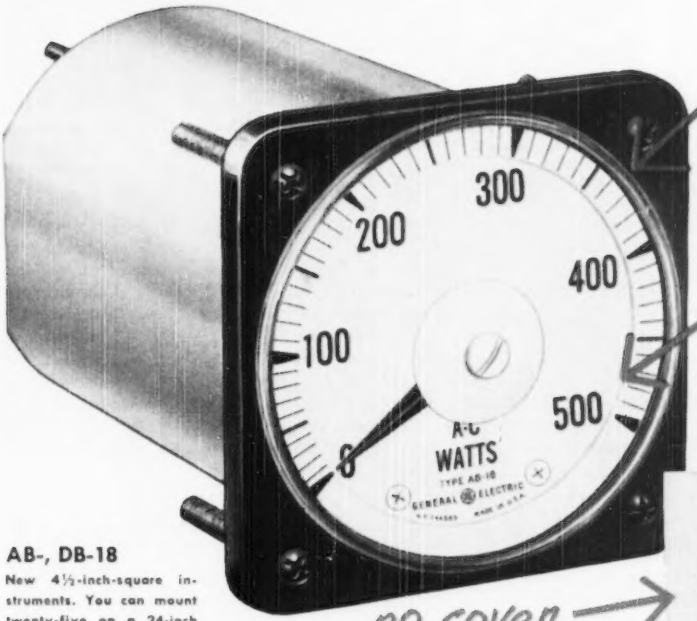
If the hard surfacing prolongs the life of the reclaimed partitions an additional year, which we have every reason to believe it will, the estimated total net saving would average around $1,690 per year for all 4 boilers, or an equivalent of 92% saving over original cost. This saving is based as follows:

New castings ($1,833/year for three years)	$5,499
Reclamation cost	426
Total saving (three years)	$5,073
Saving per year	$1,691
Percent of original cost saved	92%

* Now Maintenance Supervisor at Philip Sporn Plant of Graham Station, W. Va.

LONG SCALE *Instruments*

new!

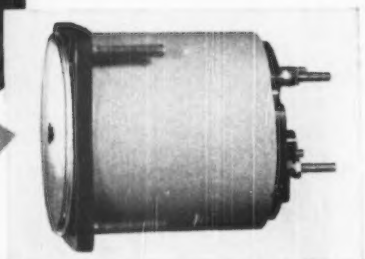


easier to read!

AB-, DB-18

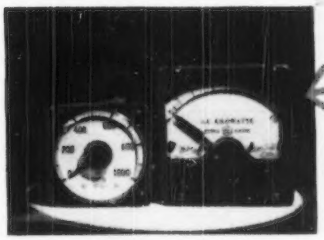
New 4½-inch-square instruments. You can mount twenty-five on a 24-inch square panel. 250-degree scale is 7.1 inches long.

no cover overhang!



Here are new switchboard instruments you can *read*—always. No more shadows caused by overhead lighting. No more cover overhang. The dial is set forward, flush with the front of the case, and a protruding convex-type glass front provides clear illumination from any angle. Anti-glare glass prevents reflections. Even when the lighting angle is sharp, you can easily read these new long scale instruments.

You can obtain these 4¼-inch instruments as d-c ammeters and volt-ammeters; a-c ammeters, voltmeters, and wattmeters; frequency and power-factor meters; temperature indicators and synchroscopes; all with the easy-to-read 7.1-inch scale.



compare the readability!

Both instruments are illuminated at a sharp angle from above. Note the absence of shadow and uniform lighting that result from this new design.

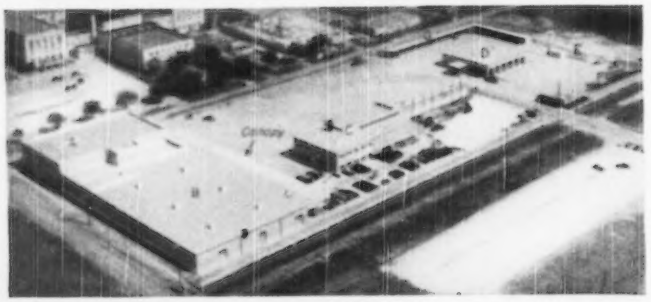
Specify General Electric long-scale instruments for control stations, testing devices and other installations. Ask your G-E representative today for more information. Apparatus Department, General Electric Company, Schenectady 5, New York.

GENERAL ELECTRIC

602-182

Gulf States Utilities Builds Service Headquarters

SERVICE HEADQUARTERS on the western outskirts of Beaumont, Texas, consolidates operations of Gulf States Utilities Co which previously were in several widely separated buildings in the downtown section. Latest facilities for saving time and cutting costs are incorporated. The design provides for fire prevention and control measures that minimize insurance costs.



SERVICE HEADQUARTERS is located on a plot 835 ft long and 325 ft wide. In this area are: office (A), storeroom (B), line and substation building (C), garage (D), paint shop (E), pole yard (F), and car storage shed (G). Fireproof wall between office and storeroom contributes to reduced insurance costs. Auditorium for 200 is in office building

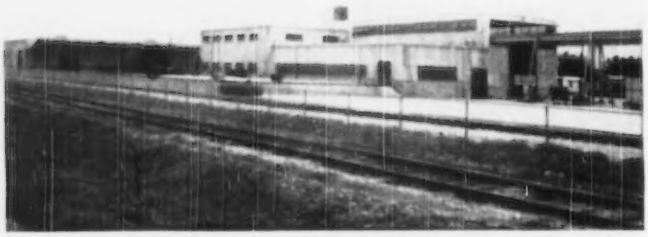
Special Features

Features of the headquarters, in addition to those illustrated, are as follows. Maintenance and servicing of automotive equipment is handled in the garage equipped with nine hydraulic lifts and a monorail for lifting and handling equipment. Two fans in the building take out hot air in the summer. Hot-water radiant heat is provided in the garage from welded pipes buried in the concrete floor.

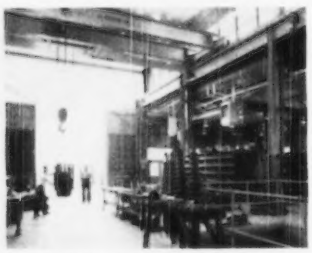
Paint shop of quonset-hut construction is separated from the other buildings. It is divided into three sections—one for spraying, a second for infrared drying and a third for compressor and equipment. Isolation of compressor and equipment is for fire prevention purposes. Building wiring is explosion-proof type. Filtered air with a blower takes away paint fumes. Plastic skylights over the spray section provide natural light with minimum danger to employees from breakage.

Pole storage, arranged so that unloading is on one side and loading on the other, insures use of older poles first. In the office building, an auditorium seating 200 provides for home-economist demonstrations, employee training classes and other meetings.

Heat for main buildings is provided by a heat pump, with two wells of 300 and one of 500-gpm capacity.



LINE AND SUBSTATION building has a heavy duty, 20-ton crane with rails extending out into the yard. Loading and storage platform is at truck-bed level. Lockers in this building are ventilated with forced air to eliminate odors and keep clothing dry



SUBSTATION SHOP has pit under large crane for pulling cores on large transformers. A monorail handles small transformers

CANOPY over storeroom loading platform protects trucks parking overnight. Platform also extends half the length of office space

SHOP handles pre-delivery inspection of ranges sold by company or dealers and repairs home appliances bought from company

SPIRAKORE® TRANSFORMERS

Sealed to live longer

Every opening in every General Electric Spirakore® transformer is sealed with a Nitrile* rubber gasket.

Sealing is so complete that *breathing is stopped.* Hottest summers and coldest winters won't draw moisture or dust into the tank. Life of transformers is prolonged.

With this sealing, *accessibility is actually improved.* Unclamp the tank cover, and it lifts right off. No adhesives to break. No surfaces to clean before resealing. You even re-use the gasket.

This better sealing is only one of the reasons why we say: Today's Spirakore still leads the field—the finest distribution transformer we've ever made—the finest you can buy.

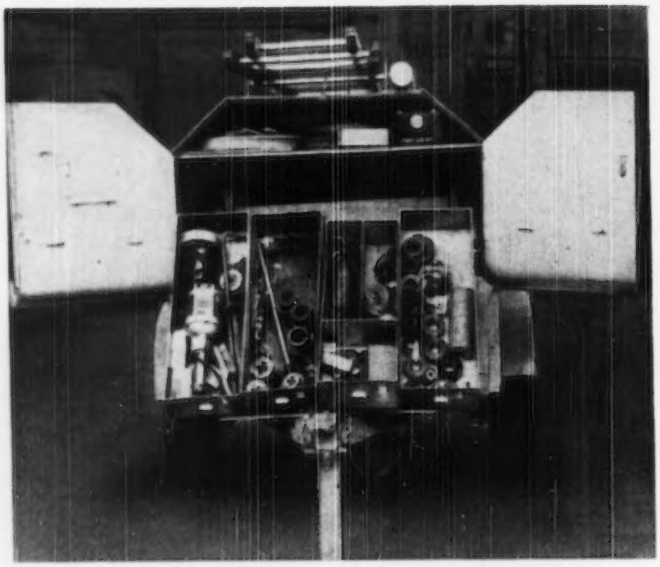
*Nitrile rubber gaskets—first introduced in transformers as a result of work by the G-E Pittsfield laboratory (in 1941)—resist oil, age, sunlight and operating temperature.

Apparatus Department, General Electric Company, Schenectady 5, N. Y.

GENERAL ELECTRIC

Convenient Trailer for Substation Maintenance

J. D. WINGFIELD
Substation Maintenance Foreman
Bluefield & Bluefield-Clinch
Valley Districts
Appalachian Electric Power Co
Bluefield, W. Va



TRAILER for storing and transporting substation maintenance equipment has drawers and bins to keep necessary tools and material in orderly arrangement. Gasket material is stored on upper shelf. Double doors make this shelf accessible from either end

ONE CONVENIENT WAY of storing and transporting substation maintenance equipment is to use a ½-ton, 2-wheel trailer with a compartmented body. This company made such a trailer with a body 72 in. long, 50 in. wide and 44 in. high. On top of the trailer are a ladder rack and pipe-holder for hotsticks. Doors at each end provide access to five large compartments.

These compartments hold gasket repair materials and cutters, glass gage repair kit, pipe dies, portable grinder, portable vises, cleaning fluid, burning torch and miscellaneous items. Previously, valuable time was lost searching for such articles when carried on standard maintenance trucks which lacked space for orderly storage. In addition, gasket material was frequently damaged.

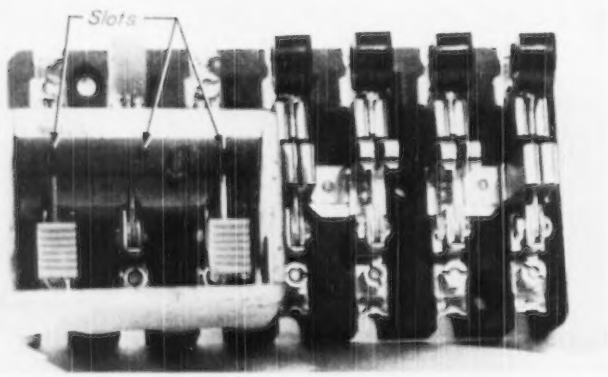
Conversion material for the trailer frame and cover consisted of 35 ft of ¼ x 2-in. flat iron, seven 4x6-ft sheets of 16-gage iron, four pairs of door hinges and four hasps and staples for locking the doors. Drawers and ¼x3x3-in. angle iron, used for body frame, were salvaged from scrap. The body may be removed from the trailer by taking out eight bolts.

Pipe vise and machinist vise are mounted for convenience on a 10x32-in. piece of ½-in. sheet iron, bolted to the trailer drawbar. Pipe vise was mounted slightly askew so that long pieces of conduit or pipe may be worked without first removing the machinist vise.

About 40 manhours, mostly during slack hours, were required to complete the trailer.

Spacer Block Protects Potential Switches

T. A. LEANDRO
Meter Department
Narragansett Electric Co
Providence, R. I.



WOODEN SPACER BLOCK mounted on standard instrument transformer test block prevents accidental contact while work is being done on adjacent meter wires or equipment

WOODEN SPACER BLOCKS, which cover five potential switch blades of standard instrument transformer test blocks, prevent accidental contact while work is being done on adjacent meter wires or equipment. Any sound, dry wood may be used if given a finish coat of insulating paint or varnish.

The device is put in place after potential switches are opened. Switch blades are then moved toward closed position until projections on the blades enter slots in the back block.

NO OVERHEATING . . .
LESS OXIDATION . . .
YOU SAVE 10—15% WITH

SILVER CONTACT SURFACES AT NO INCREASE IN PRICE

POWER CONNECTORS

SILVER is used exclusively on *all* General Electric connectors because it allows power to flow between conductor and connector with minimum losses, and avoids overheating.

Maintenance is reduced, since there is no troublesome copper-oxide formed. Oxide formation causes overheating which in turn hastens oxidation; a vicious cycle that may cause the connector to fail. When you use G-E connectors with silver contact surfaces, the cycle can't even get started.

CORRECT MATERIAL for the job is another feature assuring you that G-E connectors "run cool." The composition of the alloy used permits the connectors to carry the maximum current of any conductor . . . cable, tubing or rod . . . without overheating.

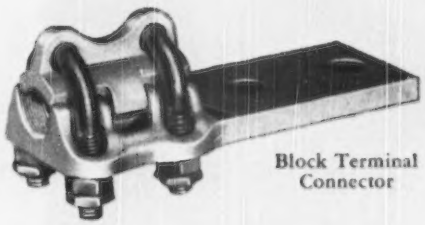
By using General Electric connectors you're assured of long connector life because of silver contact surfaces and correct material for the job—double safeguards against oxidation troubles, and they don't cost you a cent extra.

CHECK THESE ADDITIONAL FEATURES . . .

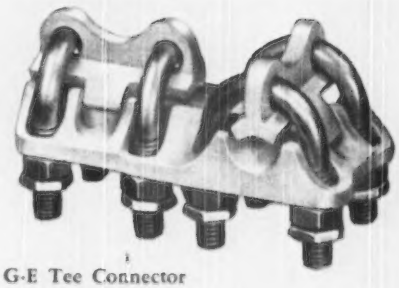
SERRATED CONTACT SURFACES give high grip strength and a permanent, high-conductivity joint that will resist vibration and give positive pressure on the conductor at all times.

NON-CORRODIBLE HARDWARE is of high-strength bronze alloy that maintains pressure during long service. G-E connectors will not twist, distort, or season crack.

INTERLOCKING SIDES confine the conductor within the connector enclosure, thus obtaining full advantage of the conductor's current-carrying capacity.



Block Terminal Connector

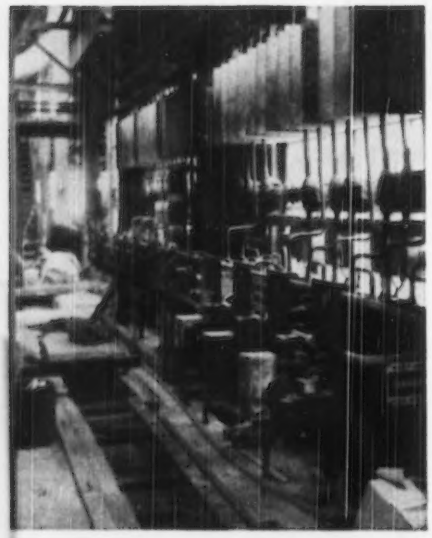


G-E Tee Connector

Place an order today with your G-E sales representative and start realizing the many benefits to be gained by using General Electric connectors. Also, write for a copy of publication GEC-400 that contains 40 pages of valuable information on G-E connectors, and see for yourself how easy they are to order. Write to *Apparatus Dept., Section 856-55, General Electric Company, Schenectady 5, N. Y.*

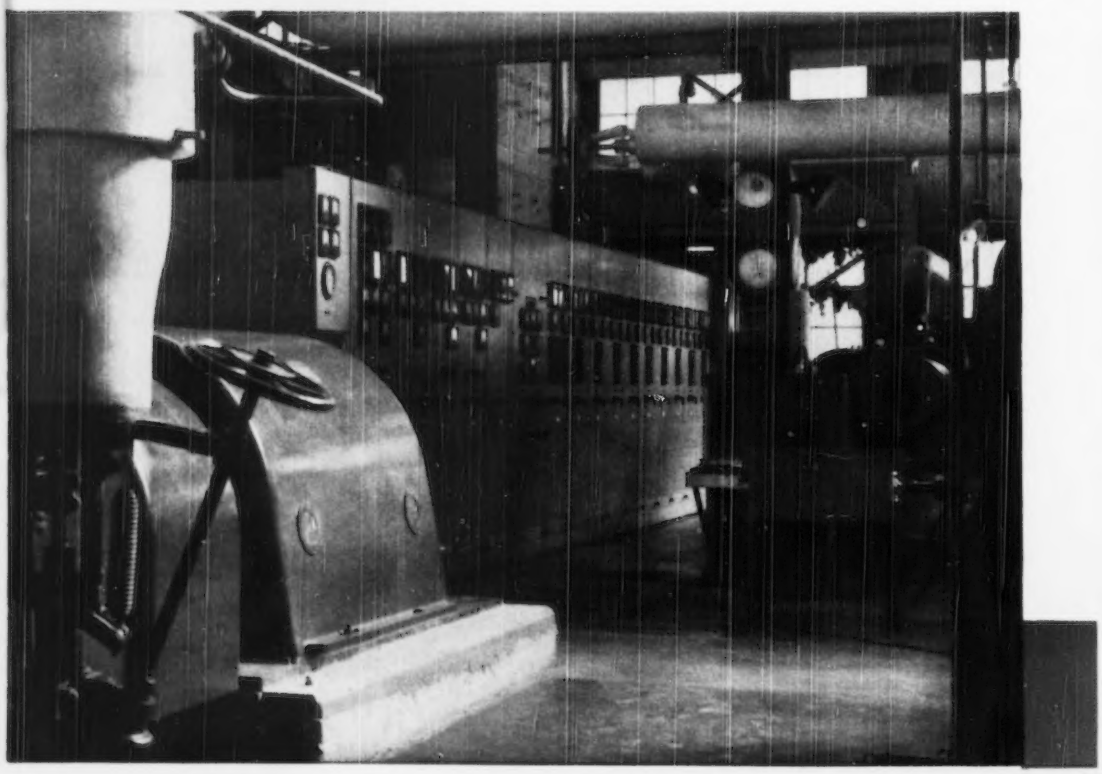
GENERAL ELECTRIC

FREEPORT SULPHUR EXPANDS



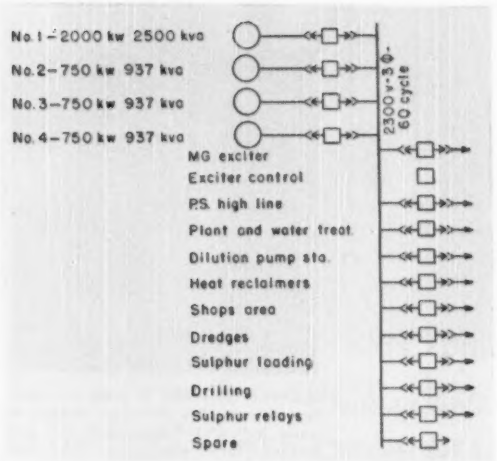
This inadequate, open-type switchgear was replaced by the new G-E Metal-clad equipment shown below. Freeport Sulphur officials recognized that the old switchgear had outgrown its usefulness.

Here's the new General Electric 5-kv Metal-clad switchgear installed at Freeport Sulphur. Magne-blast power circuit breakers have plenty of "IC" (Interrupting Capacity) to handle all short circuits that may occur on Freeport's expanded distribution system. This assures continuous power for vital production.



AND MODERNIZES WITH

METAL CLAD SWITCHGEAR



This one-line diagram shows power distribution at Freeport Sulphur as planned by Sargent and Lundy, consulting engineers of Chicago. General Electric Metal-clad switchgear handles the 2300-volt power from the generators through power circuit breakers of 100,000-kva interrupting rating.

The Freeport installation is a complete General Electric project—one source of responsibility plus the very best in co-ordinated planning, engineering, manufacturing, and service facilities to give maximum savings and efficiency to the customer.

Be sure to see the "More Power to America" full-color sound slide-film "Modern Industrial Power Distribution." Ask your G-E sales representative to arrange a showing for your organization.

WHEN Freeport Sulphur expanded their production facilities they put in a new turbine to take care of the increased load.

At the same time they replaced all their old equipment with General Electric switchgear.

When you order G-E switchgear you get all the equipment and service from one reliable source. And with everything pre-assembled at the factory it takes very little time to get the switchgear in place and operating.

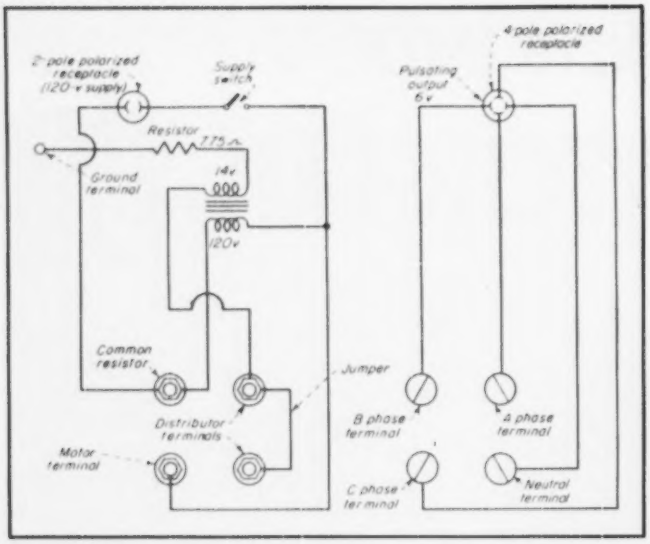
MODERN INDUSTRIAL power distribution systems using G-E switchgear are applicable to any industrial plant or commercial building where you want. . . .

- Proper voltage for top performance of equipment
- An extremely flexible setup to take care of expanding or changing loads
- Adequate short-circuit protection
- Protection for personnel
- Low installation and maintenance costs

INVESTIGATE TODAY the many advantages of using General Electric switchgear to get the same benefits gained by Freeport Sulphur. Contact your G-E sales representative for further information—or write for the helpful bulletins listed below. *Apparatus Department, General Electric Company, Schenectady 5, New York.*

GEA-3083 Metal-clad Switchgear
GEA-4966 Low-voltage Metal-enclosed Switchgear
GEA-3592 Load-center Unit Substations
GEA-3758 Load-center Power Distribution

GENERAL ELECTRIC



PHASING TRANSMITTER sends low-voltage coded impulses for safely and quickly phasing subway distribution cables during construction, repair or reconstruction operations

L-V Impulse Transmitter for Phasing Cable

A PORTABLE transmitter for phasing subway distribution cables sends out low voltage impulses on a 4-conductor cable, the return being via the grounded cable sheath. This device minimizes circuit outage time during construction, repair or reconstruction of underground distribution cables and equipment.

The transmitter was developed by Public Service Electric & Gas Co, Newark, N. J., and was shown at a gadget exhibit in connection with a recent EEI-T&D Committee meeting. It consists of a disk type induction motor, a 50-w, 120—14-v transformer, a distributor with four coded disks, and a 50-w current limiting resistor of 7.75 ohms. This equipment is mounted in an aluminum box equipped with a cover and a handle. The indicator is a standard automobile type 6-v, 15-cp bulb and socket equipped with leads.

One side of the box mounts a 2-pole polarized receptacle and lock cap for 120-v, 1-ph 60-c supply, a spst, 125-v, 10-amp flush switch, and a 4-pole polarized receptacle and lock cap. In addition, an uninsulated ground terminal (4-in. brass bolt and thumb screw) is fastened directly to the case. Wiring is standard rubber insulated braid covered cable.

The phasing transmitter operates from 120-v, 1-ph, 60-c circuit and has a separate motor connection so that contact cams on a common shaft can be operated at approximately 4 rpm on 120-v source. The distributor consists of four coded disks which close, successively, four sets of contacts to provide the code signals.

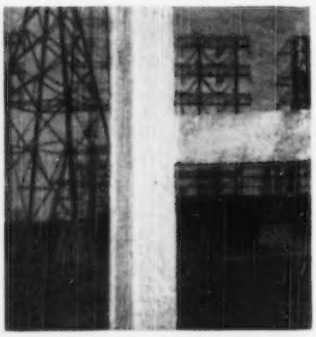
Four secondary outlets are provided, one each for one, two, three and four impulses. The usual code is one impulse for A conductor and two, three and four impulses for B, C and neutral conductors, respectively. The code may be changed as desired.

Grounded to Station Bus

Impulses are of 0.5 sec duration. Length of the off-period between individual impulses is also 0.5 sec. Length of period between groups of impulses is 1.6 sec.

The transmitter is connected at the substation by grounding the common return to the station bus, to which all distribution cables in the substation are bonded, and connecting the leads from the distributor to the proper phases of the cable. Phases are identified by splicers connecting the 6-v test indicator between any conductor and ground and counting the number of impulses received on the individual conductor. Each individual signal should be received twice before phases are tagged in order to avoid any possibility of confusing phases.

Because the phasing transmitter is a low voltage operating device, it can be left in operation without hazard until it is convenient to remove it.



CLEANED SURFACE of angle-iron structure illustrates how structural members of towers look after flame priming and wire brushing. Flame priming was done with multi-flame head on an oxyacetylene torch

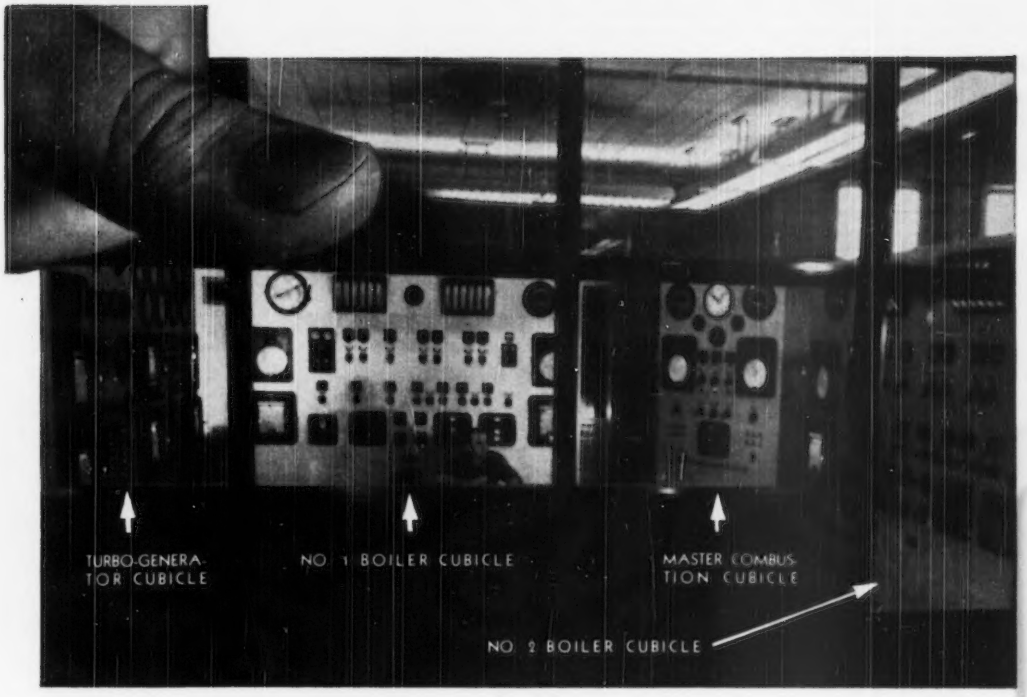
Flame Priming Prepares Towers for Painting

S. J. WARD
Assistant Superintendent
Transmission Department
Houston Lighting and Power Co
Houston

FLAME PRIMING proved to be the most satisfactory method for preparing for painting some unusually high towers on the Houston Lighting and Power Co system. These towers include two that are 288 ft high, two that are 148 feet high and two 85 ft high.

Some Members Ungalvanized

When towers were installed in 1924, there were no galvanizing vats large enough to accommodate the length of some of the members of the lower section of the 288-ft towers. These ungalvanized members and the age of the parts that were galvanized, coupled with the salt water and



THESE L&N-BUILT CUBICLES PUT STATION OPERATION "UNDER ONE THUMB"

Control-wise, the outstanding feature of Warren Station of Pennsylvania Electric Co. is that it demonstrates the coordinated, "under one thumb" regulation of boiler, turbine and generator. A single operator, stationed in a central control room, has undivided responsibility for every step, from putting coal into the furnace at one "end" of the plant to turning out kilowatts at the other "end". Gone are telephone conversations between boiler room and electric control room operators—gone is divided responsibility.

PENELEC engineers secured the control equipment for this efficient operation in a highly efficient way. They turned over the whole job of designing control cubicles to Leeds & Northrup specialists. We can handle this work effectively, because we make key instruments for so many processes—Metermax Combustion Control; Micromax Superheat Control; Micromax recorders for temperature, CO_2, conductivity and other conditions.

Drawing on our years of experience in power instrument layout, we proceeded to design PENELEC's cubicles from the ground up to meet their particular needs. Instruments and controllers, switches, stop-start stations, signals and alarms were arranged for correct sequential operation. Each cubicle was detailed on complete drawings showing steel work, internal piping and actual final wiring.

Before leaving the L&N plant, each cubicle was completely assembled and then tested as a unit. When the equipment reached Warren, every connection to every instrument, controller, switch and signal was in place. To be ready for use, the group of cubicles needed only to be set in position and connected to electric control drives, primary elements and station power supply. The user saved much time, trouble and expense for his own engineering staff, and has the advantages of an entirely factory-assembled cubicle.

We'll be glad to send information about L&N instruments, controllers, and panels or cubicles. Write to Leeds & Northrup Company, 4938 Stenton Avenue, Philadelphia 44, Pennsylvania.

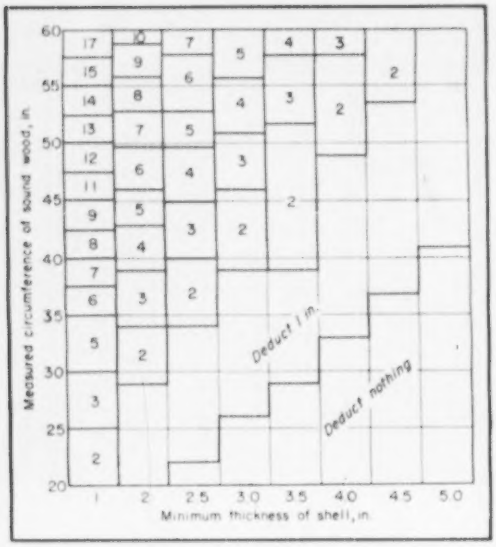
MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

LEEDS & NORTHRUP CO.

Jrl Ad N-460(2)

A Guide to Determine Pole Strength

Methods for field inspection of wood poles and allowances for defects found during inspection—adapted from overhead construction standards of New England Electric System



DEDUCTIONS IN INCHES to be made from measured circumferences of sound wood for poles having hollow hearts

A. Field Examination. Inspection should include the pole and all anchors, guys, braces, fittings, equipment and appurtenances attached thereto. The pole should be examined for rot below the ground line and for all other defects, above and below the ground line, such as hollow heart, exposed and hidden pockets, woodpecker holes, splits, checks and damage caused by insects.

B. Minor Repairs. It is recommended that, if possible, the inspection be arranged to include the making of minor repairs so that a thorough examination of tops of poles and crossarms can be made by climbing. This is especially important for pine poles.

C. Exceptional Conditions. Note any hazardous conditions resulting from faulty or non-standard construction. Also note such maintenance conditions as need of replacement of guys, anchors, crossarms etc, need of plumbing poles, necessary tree trimming or any other defects which may require attention.

D. Determination of Circumference of Sound Wood. To estimate the mechanical strength of the pole, the remaining sound wood is to be measured at the section of maximum decay which ordinarily is at or below the ground line. Such measurements will ordinarily be required for all poles except those in which other defects are obviously such as to require prompt attention. Poles which have not started to show any deterioration need not be measured if the circumference shows on the pole record. Following methods are to be used in determining the circumference of sound wood.

1-Preferred Method. Remove the earth from around the pole sufficiently to permit the inspection of the section of maximum decay which generally occurs at a depth of 6 to 12 in. below the ground line. In some cases, however, particularly in porous soil it may be at a considerably greater depth.

Remove all completely decayed wood with a pole inspection scraper using care to avoid damage to the treated portions of poles and unnecessary removal of sound wood. When the wood shows only discoloration or partial decay beyond the area of complete rot, do not remove any more wood. By "partial decay" is meant a change in the composition of the wood which reduces somewhat the strength of fibers but still provides a substantial proportion of original strength. Do not chop away good wood in order to expose a decay pocket. Explore the extent of the pocket by boring with an increment borer.

After the decayed wood has been removed measure the minimum circumference of the pole with a tape.

2-First Alternate Method. The circumference of sound wood can also be determined by carefully prodding the pole just below the ground line with a pole prod. The pole prod is a tool made of about ¼ in. stock about 2 ft long with a convenient handle on one end and the other end drawn out to a long sharp point. By this means the inspector can measure the average radial depth of decayed wood and, multiplying it by 6.3, determine the reduction in the circumference of sound wood.

3-Second Alternate Method. Still another but less satisfactory method of measuring the extent of decayed wood at the ground line is by the use of a ½ in. bit and brace or by an increment borer. Multiple borings weaken the pole and should not be resorted to if the pole can be inspected in any other way. Holes should be plugged with creosoted dowels. The borer should enter the pole at as low a point as possible and at an angle to the vertical of approximately 30 deg. The depth of rot can be measured by splitting the core lengthwise when using the increment borer and by watching the shavings and by the feel of bit going into the wood in the case of the bit brace. The necessary correction to allow for the angle of entry of the borer should also be made. The final measurement of rot multiplied by 6.3 will give the loss in circumference of wood.

E. Determination of Hollow Heart, Enclosed and Exposed Pockets. Sound each pole at several places around the pole from below the ground line to 4 or 5 ft above ground, to determine whether or not there may be hollow heart or enclosed pockets and their location. Where hollow heart is found, locate the place where the shell is thinnest by careful sounding and determine the thickness at this point by boring.

Wherever sounding indicates an enclosed pocket, determine its extent by boring and measuring the depth of the pocket and the thickness of the shell. After removing the increment borer from the pole, the hole should be plugged with a treated wood dowel slightly larger than the hole.

Exposed pockets should be carefully examined to determine their width and depth. All decayed wood should be thoroughly scraped out and the pocket painted with wood preservative.

F. Allowance for Specific Defects. The circumference measurements of poles having defects at or near the ground line, such as hollow heart, enclosed or exposed pockets do not provide an accurate measure of the amount of sound wood. Accompanying chart gives the deduction to be made from the measured circumference for poles having hollow heart. After the deduction is made the remainder is the circumference of a solid pole of equivalent strength and is the circumference to be used in referring to the inspection chart.

Measurements of poles having enclosed pockets on the transverse side at or near the ground line may be corrected in the following manner. If shell is more than 1 in. thick and less than 2 in. treat the same as hollow heart and deduct one additional inch. If shell is less than 1 in. thick, treat as exposed pocket, explained in the following paragraph.

Measurements of poles having exposed pockets of varying shapes and dimensions, at or near the ground line, may be corrected by deducting the amounts given in the table, in which width refers, in general, to the horizontal width at the outside of the pole and depth is the average distance obtained by measuring at right angles from a straight edge placed across the pocket. See table on page 132 of this issue.

G. Inspection Chart (ERS 50-39, EW, Sept. 25, 1950, p 116). Scales 9, 10 and 11 give the minimum allowable circumference of sound wood at the ground line. These circumferences are obtained after the load has been determined (ERS 50-40, EW, Oct. 9, 1950, p 132). If the critical section occurs above ground, use the height of pole above the critical section on Scale 8 in place of pole length on Scale 7.

H. Restoration after Inspection. When the inspection is completed, replace the earth and make a mound around the butt of the pole. If the earth replaced is insufficient to form a mound which will afford drainage away from the pole, obtain additional earth and use for this purpose. Stones removed during the excavation for inspection should be replaced against the pole surface when backfilling.

Keep Operating Costs down with "HIPERCORE"

Keep operating costs down by reducing transformer outages. Savings obtained by economical system planning and efficient operation can be wiped out quickly by a higher-than-average transformer mortality rate.

It takes more than high electrical efficiency or low exciting current, or low impedance to make a transformer economical. It takes built-in ruggedness with ability to withstand severe overloads, lightning surges and intermittent secondary faults. It takes *balanced design* . . . no one feature exploited at the expense of another. The chain is no stronger than its weakest link.

For low overall cost over a period of years, specify Moloney HiperCore Distribution Transformers.

Improved Short-Time Overload Capacity

Improved short-time overload characteristics provide better peak load performance and longer life. Reduced coil mass, achieved through use of oriented steel cores together with the extensive use of cooling ducts, results in more rapid cooling of windings and lower hottest-spot temperature gradient.

High Surge Resistance

Moloney HiperCore Transformers are designed to withstand lightning surges well in excess of the minimum requirements. A high factor of safety in properly distributed insulation and vacuum processing produce the ultimate in overall dielectric strength.

Greater Mechanical Strength Against Short Circuit Forces

Coils are made mechanically rigid through the use of heat curing bonding material. The coils are blocked solidly by the impregnated core which is in turn banded with tons of force, providing maximum strength against short circuit forces.

MOLONEY ELECTRIC

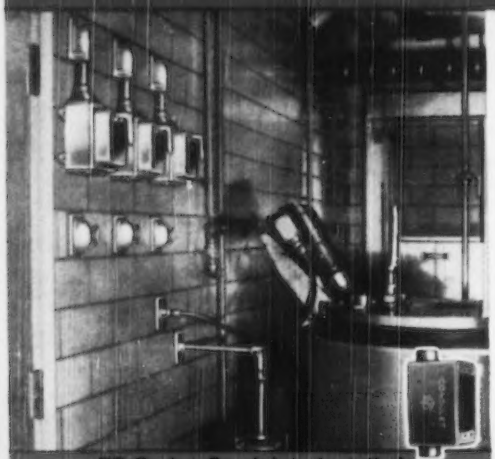
- LONGER OPERATING LIFE
- HIGH FACTOR-OF-SAFETY IN DESIGN
- LIGHTER WEIGHT
- SMALLER SIZE
- BETTER VOLTAGE REGULATION
- SUPERIOR TAP CHANGER

MOLONEY ELECTRIC COMPANY

FACTORIES AT ST. LOUIS 20, MISSOURI AND TORONTO, ONTARIO, CANADA

MEC 50-5-8V

the CONDULET* and rigid conduit method gives you maximum

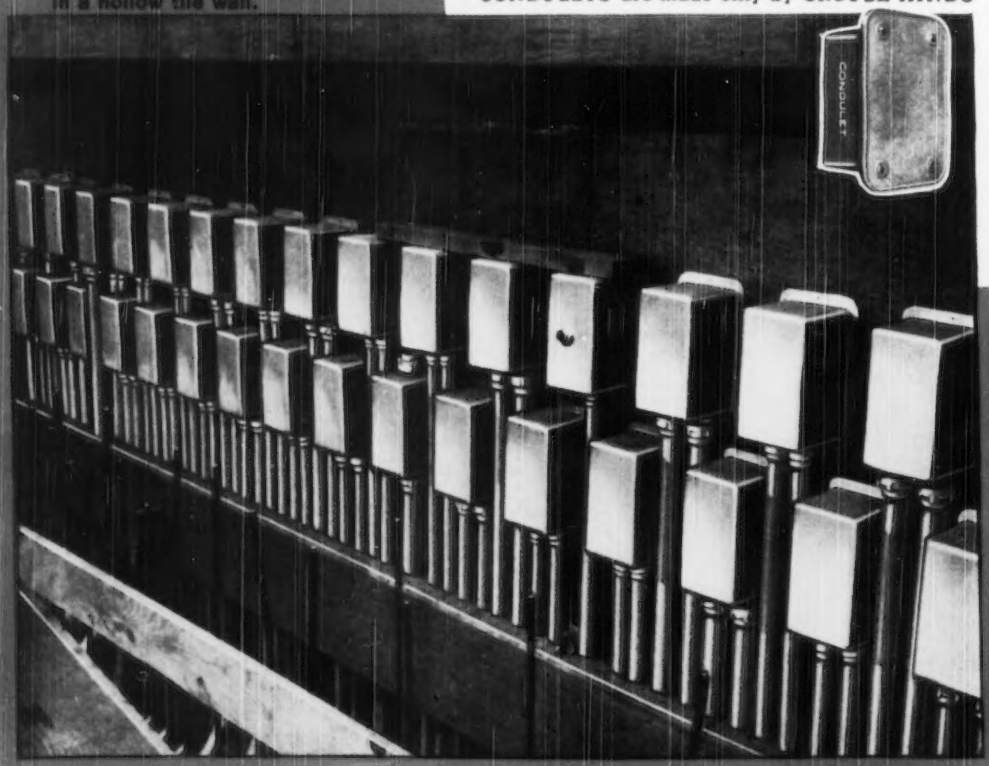


FS Series Condulets installed in a hollow tile wall.

PROTECTION and SAFETY in concealed work

When you plan a job of concealed electrical wiring, every factor that has a bearing on the kind of service it will give throughout the life of the installation should be carefully considered.

**CONDULETS are made only by CROUSE-HINDS*



Type AEQ Condulets, with brazed hubs, placed in position on concrete forms.

"for MODERN WIRING . . . the CONDULET and conduit method gives you definite advantages"

1 ECONOMY . . . Add up the material and the installation costs and you will find that Condulets and rigid conduit compare favorably with other wiring methods. Then consider the other advantages and you will find that Condulet and rigid conduit is the really economical method that pays extra dividends over the years.

2 GROUND CONTINUITY is of vital importance in concealed work because any joint that isn't tight in the beginning makes a high resistance point and after the concrete has been poured there is never any way to locate and correct the faulty condition. CONDULETS, with their taper threaded hubs, and rigid conduit with its tapered threads make a secure joint that provides a reliable and permanent low resistance path to ground. This SAFETY feature affords maximum PROTECTION against personal injury and fire.

3 CORROSION RESISTING . . . Cast Feraloy Condulets offer the best PROTECTION wherever moisture, dust, or corrosive atmospheres are present. This quality is very important in concealed work because corrosive tendencies are greatest where there is a change of medium, as at the point between the floor or wall and the air.

4 FLEXIBILITY . . . In concealed work Condulets with blank covers can be placed at strategic locations to provide future outlets to meet changing conditions.

5 SECURE ATTACHMENT OF DEVICES . . . The mounting holes in CONDULETS are drilled and tapped in the cast metal body — no weak mounting ears to twist off. All devices are FIRMLY attached.

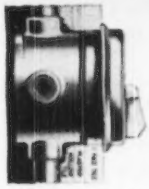
6 QUALITY . . . For more than forty-five years CONDULETS, made only by CROUSE-HINDS, have been the standard of quality, built from the finest materials, with painstaking care, by skilled craftsmen.

7 VARIETY . . . There are thousands of types and sizes of CONDULETS, plugs and receptacles, and lighting fixtures including a complete explosion-proof and dust-tight line for use in hazardous locations.

On your next job of concealed work, plan to get all of the benefits of sturdy Cast Feraloy CONDULETS and rigid conduit. Send for additional information on modern CONDULET installation.

CROUSE-HINDS COMPANY
Syracuse 1, N. Y.

Offices: Birmingham — Boston — Buffalo — Chicago — Cincinnati — Cleveland — Dallas Denver — Detroit — Houston — Indianapolis — Kansas City — Los Angeles — Milwaukee Minneapolis — New York — Philadelphia — Pittsburgh — Portland, Ore. — Salt Lake City San Francisco — Seattle — St. Louis — Washington. Resident Representatives: Albany Atlanta — Baltimore — Charlotte — New Orleans — Richmond, Va.
CROUSE-HINDS COMPANY OF CANADA, LTD., TORONTO, ONT.



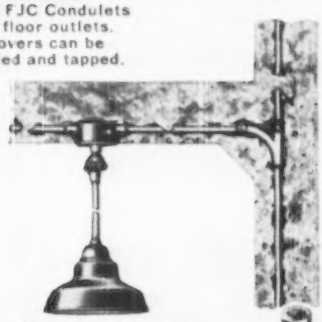
Type EHS Explosion-Proof Switch Condulet in a hollow tile wall

GUA Series Explosion-Proof Condulets with lugs for nailing to concrete forms.

Type AD Watertight Condulets for flush mounting in floors or walls.

Type FJC Condulets for floor outlets. Covers can be drilled and tapped.

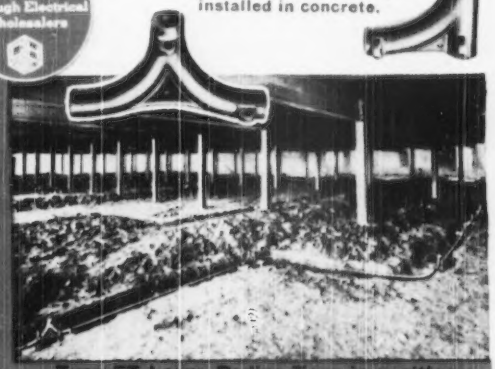
GRF Series Condulets with slotted nailing lugs.



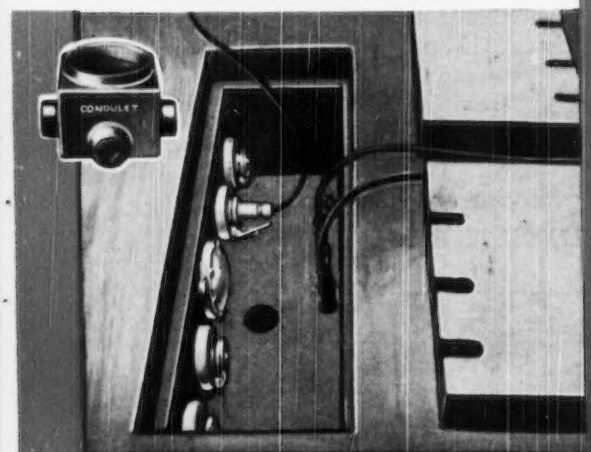
Type SKC Condulet and Type EY Large Radius "Y" installed in concrete.

SK Series Condulets with nailing lugs. For walls, floors or sidewalks. Have flush cover screws.

A Nationwide Distribution Through Electrical Wholesalers



Type ET Large Radius Tees in position for pouring a concrete floor.



Explosion-Proof Type GUB Junction Condulet and Type CPS Arktite Plug Receptacle Condulets in a concrete pit

Type AEQ Arktite Plug Receptacle Condulets in a concrete pit.

Load Division in Transformer Banks

Charts provide means for determining division of load in (1) a delta-delta connected bank of three transformers, and (2) a bank of two parallel-connected transformers

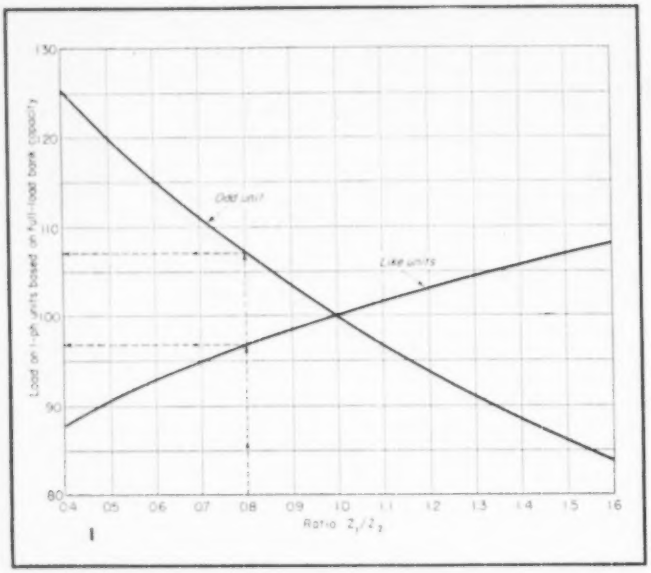
N. H. ERLANDSON
Distribution Design Engineer
Carolina Power & Light Co
Raleigh, N. C.

Accompanying curves are based on the transformers having the same ratios of resistance to reactance, which may not be the case, but the results should be sufficiently accurate for practical use.

(1) Load division in delta-delta connected transformer bank. Two units have like impedance and third unit has different impedance. The kva and voltage ratings are the same for all three units.

EXAMPLE

Transformer A, 100 kva, Z = 2.5%
Transformers B and C, each, 100 kva, Z = 3.12%
Let Z_o% = impedance of odd unit
and Z_l% = impedance of like units
Then Z_o/Z_l = 2.5/3.12 = 0.8
From curve for Z_o/Z_l = 0.8, read
Load on like units = 96.5% or 0.965 x 100 = 96.5 kva each
Load on odd unit = 107% or 1.07 x 100 = 107 kva



1

(2) Load division in parallel-connected transformers.

(A) Two units of same kva and voltage rating but of different impedances.

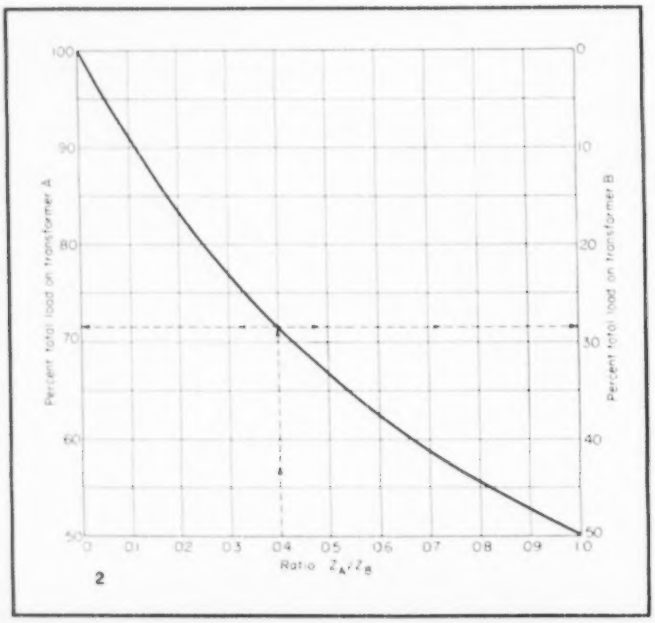
EXAMPLE

Transformer A, Z_A = 1.4%
Transformer B, Z_B = 3.5%
Then Z_A/Z_B = 1.4/3.5 = 0.4
From curve for Z_A/Z_B = 0.4, read
Percent total load on A = 71.5%
Percent total load on B = 28.5%

(B) When units are not the same size, the impedances should be referred to the same kva base.

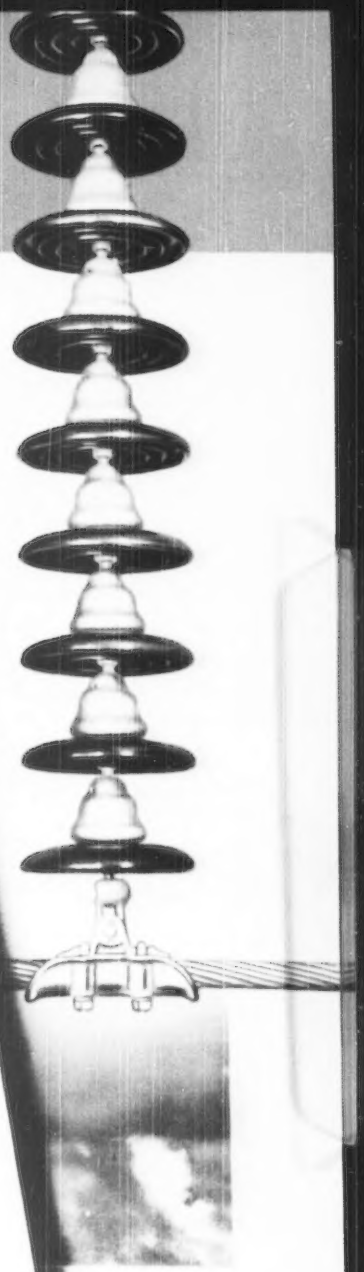
EXAMPLE

Transformer A, 100 kva, Z_A = 3.1%
Transformer B, 50 kva, Z_B = 3.1%
Z_B on 100 kva base = 3.1 x 100/50 = 6.2%
Then Z_A/Z_B ratio = 3.1/6.2 = 0.5
From curve for Z_A/Z_B = 0.5, read
Percent total load on A = 66.7%
Percent total load on B = 33.3%



2

HI-TENSION NEWS *Junior*



Clamps have no feelings . . .

WHY SPEND GOOD MONEY TO KEEP THEM WARM?

On a transmission line carrying 300 amperes per phase—not an unusual load—ferro-magnetic suspension clamps will run approximately 30 degrees (F) above ambient temperature. This consumes 20 to 25 watts *per clamp*. At 500 amperes, the temperature will rise to 45 degrees with a loss of 45 to 75 watts per clamp, or 135 to 225 total watts per 3-phase line at each structure. This is quite a price to pay just to keep clamps warm. It might be better used to light the right-of-way, which it would do fairly well. Still better, it might be saved.

By eliminating the magnetic reaction of ferrous metals in a high voltage field, O-B Cooline clamps closely approach the zero point in wasted power. The non-magnetic properties of high strength aluminum alloy accomplish this. Depending upon loads, O-B Cooline clamps pay their entire cost, usually, in one to three years; then keep returning this sum as a direct power saving for the life of the line. All this time, they act to preserve the conductor. In several ways, you actually get paid to use them!

In addition to direct power savings through using O-B Cooline clamps, the heavy investment per kw in generation is allowed to earn its normal profit when otherwise wasted power reaches the meter.

It might be a good idea to discuss Cooline hardware with your O-B representative. He can tell you about a fine clamp that pays its own way!

Ohio Brass

MANSFIELD, OHIO, U.S.A.

HI-TENSION NEWS *Junior*

Low Average Ratings
Minimum Tolerances

. . . Both are combined in the New O-B Thorex Arrester to give you fullest apparatus protection.

"Average IR Voltage Discharge" is not the full measure of lightning arrester protection. Any device consisting of a multitude of parts and compounds made under conditions of mass-production, has inherent variations from its average basic rating. These variations are covered by tolerances which are *added to* ratings. Thus the useable protection of a lightning arrester is the sum of its rating *plus* its tolerance.

O-B Thorex valve type lightning arresters have brought to the American market the lowest values of protective tolerance so far offered. This minimum tolerance characteristic, added to low average values of sparkover and IR discharge voltage, spells improved protective margin for station apparatus—valuable on both old and new equipment.

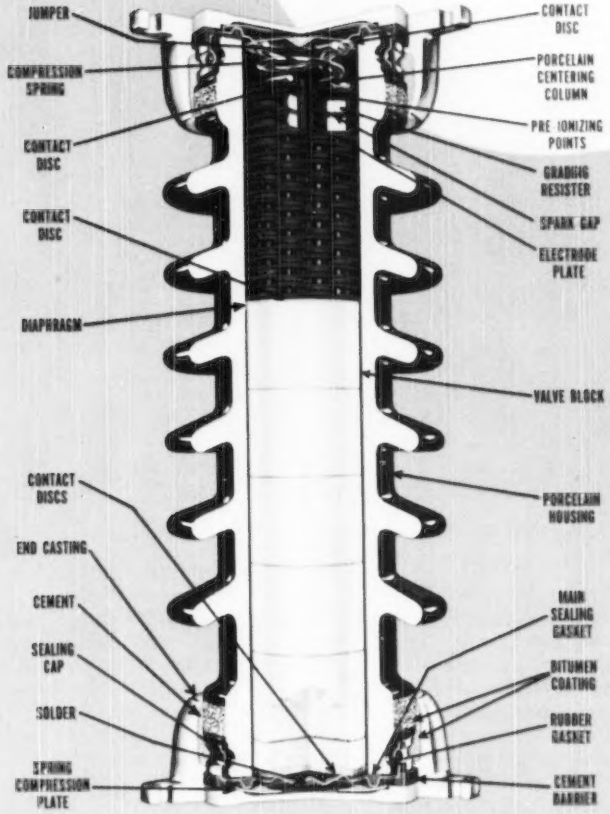
Take advantage of this superior lightning arrester protection by specifying O-B Thorex Type GP on station installations.

THOREX

valve type LIGHTNING ARRESTERS give you . . .

1. Low average IR discharge voltage with less than ± 5% tolerance.
2. Low average sparkover voltage with less than ± 10% tolerance.
3. Discharge capacity of 100,000 amperes.*
4. Duty cycle of 10,000 amperes.*

*According to AIEE Standard, 28-A



For complete technical description of the new O-B Thorex arrester, read O-B Publication 869-H, copies of which are available on request.

Ohio Brass

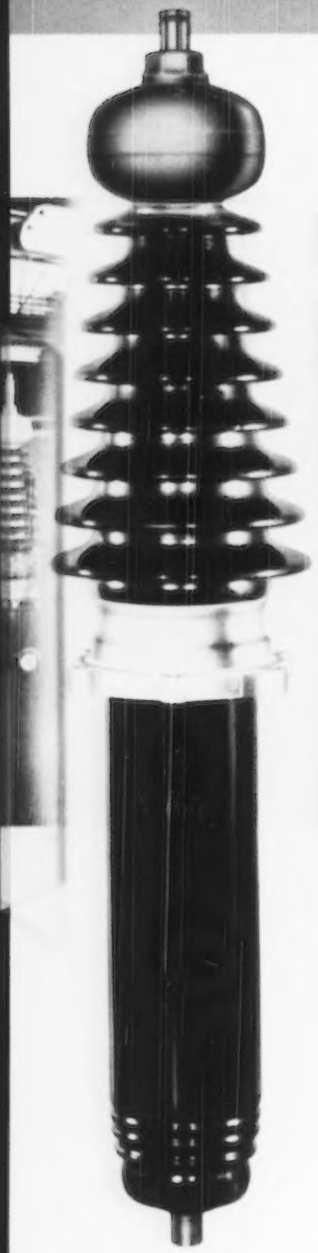
MANSFIELD, OHIO, U.S.A.

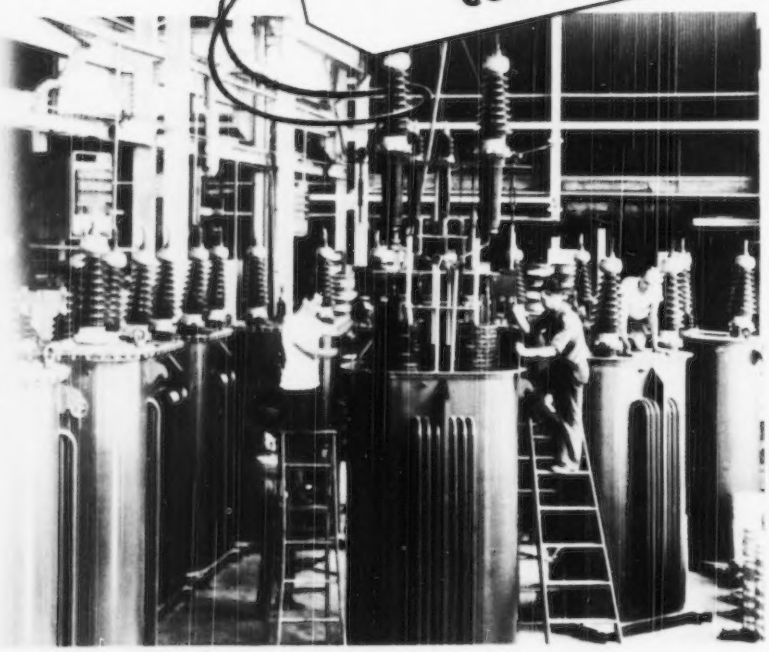
(B)

HI-TENSION NEWS *Junior*

OHIO BRASS COMPANY
Barberton Division • Barberton, Ohio, U. S. A.

TO: STANDARD TRANSFORMER COMPANY





One more set of O-B bushings is being installed in this group of Standard transformers--part of a shipment totaling 30 units destined for a large expansion project now in progress in the Midwest. Characteristics of these transformers, as outlined by their manufacturer are: "Capacity ranging from 250 to 1000 kva; those in the picture being 500 and 833 kva. High voltage, 69 kv, 60-cycle. Low voltage, 7200/12470 kv, 'Y'. Single phase. Equipped with . . ."

O-B BUSHINGS

ONE OF THE FINEST COMPONENTS OF ANY TRANSFORMER

Ohio Brass

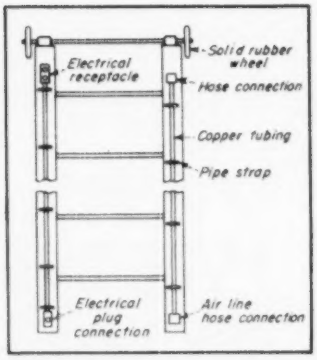
MANSFIELD, OHIO, U. S. A.

3047 H

humid chemical atmosphere, had made it necessary to check corrosion frequently.

During previous paint jobs, maintenance men were unable to thoroughly clean lap joints and tight corners where bolts were numerous. By using a multi-flame type of head on an oxyacetylene torch, rust and scale were removed with least trouble and at minimum cost. By applying initial coat immediately, while the metal was still warm, it is believed that better protection is obtained.

•



THREE ACCESSORIES attached to a ladder —air line and electrical receptacles on opposite sides and small wheels at top—make maintenance work a little more convenient

Three-Feature Ladder Facilitates Maintenance

JACK GIBSON
Gibsons Associates Engineering Co
Fort Wayne, Ind.

THREE ACCESSORIES can be built into a ladder to greatly enhance its convenience when used for maintenance work around power plants, substations, or industrial plants:

1. Small solid rubber wheels attached to each side of the ladder at the top make it possible to handle the ladder as though it were a wheelbarrow. Aside from allowing the ladder to be wheeled from place to place, the tires permit raising the ladder over rough surfaces with ease.

2. Copper tubing or a pipe strapped on one side of the ladder is useful for attaching the hose of a spray gun or air drill. The compressor is connected to tubing at the bottom of the ladder. An automatic manual shut-off valve can be used to connect hose and pipe at the top. Such an accessory is particularly useful for blowing dirt out of machinery. (Pipe should be mounted only on the top section of an extension ladder.)

3. A duplex receptacle connected to a conduit strapped on the other side of ladder provides outlets for an electric drill or extension lamp. At the bottom of ladder is a one-hole receptacle into which can be plugged the supply extension cable with a ground connection.

A variation in use consists of power cables down one side of the ladder and light cables down the other side.

Proper Loading of Meters For Rapid Field Testing

PHANTOM or resistance loading of watthour meters for quickest field testing—which should it be? Each type of loading has its particular applications and limitations. That is the decision reached on this controversial question by a three-man working group of Pennsylvania Electric Association's Meter Committee.

Specific conclusions reached about the devices supplied field testers who carry this equipment from door to door are:

1. For all polyphase meter testing, the transformer type loading device has no substitute. The higher currents required, and the testing facilities usually provided at each meter, definitely simplify such testing with the phantom load.

2. The phantom load box has a definite place in testing meters connected to current transformer secondary voltages and meters connected to current and potential transformers. The same form of loading device is also applicable to 1-ph meters in commercial areas when the meter is connected to the load side of the service switch, or exceeds a rated capacity of 25 amp. The reserve fuse capacity in such areas seldom permits the use of resistance loading.

3. Resistance type load box and test kit is to be preferred in the field for testing small capacity self-contained 1-ph, 2- and 3-wire meters.

Three-wire meters may be tested at least 8% faster using resistance loading rather than the transformer type. Two-wire meters may be tested at equal speeds with either resistance

EVERSTICK ANCHORS...

FIRST CHOICE for

- PERMANENCE
- HOLDING POWER
- LONG LIFE
- SAFETY

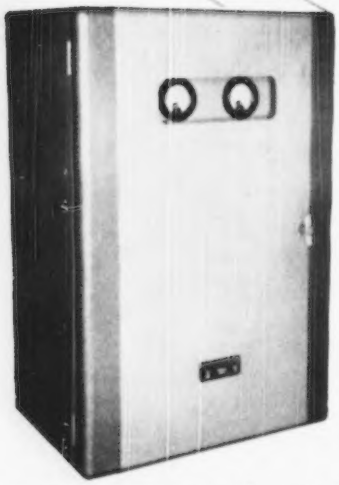
They speed up work and provide dependable anchorage in new construction and maintenance. Quick and easy to install — made of tough rust-resistant malleable iron — their holding power "tops" all others. Available two-way, three-way, four-way and cone types. Write for facts.

Exclusive Everstick nut housing. Locks anchor firmly on rod. No chance of rod slipping thru anchor.

EVERSTICK ANCHOR CO.
Manufacturer of
"THE ANCHOR OF MERIT"
FAIRFIELD, IOWA

AUTOMATIC FLOATING TYPE BATTERY CHARGER

FOR 60-CELL CONTROL BATTERIES



PEC 626

...gives you extreme accuracy and exceptional reliability

EXPRESSLY DESIGNED for unattended station service, the PEC-626 Automatic Battery Charger provides the extreme accuracy of electronic control plus the exceptional reliability demanded by this type of service.

In designing this unit, Power Equipment Company engineers started with the rugged components of a manual charger, added a magnetic system for coarse voltage control, then a simplified electronic system for fine voltage control.

The PECO Charger accurately floats the control battery of any power station or substation which has a reasonably constant switchboard load; furnishes power to the load and maintains a fully charged battery, ready for any emergency. DC output is sufficient to continuously charge 60 lead acid battery cells at 129 volts, at a maximum rate of 12 amperes, and is automatically regulated to within ±0.5 percent, for AC line voltage fluctuations of ±5 volts on a 230 volt circuit.

Exceptional reliability is shown by the fact that if the electronic control section should be disconnected, the magnetic control section will still automatically hold the output voltage to within ±3 percent of nominal voltage.

Write for specifications now!

POWER EQUIPMENT

Battery Chargers ☆ Battery Eliminators ☆ D.C. Power Supply Units ☆ Regulated Exciters ☆ and other Special Communications Equipment

55 ANTOINETTE ST. DETROIT 2, MICHIGAN

or transformer type loading devices under like conditions. However, the 2-wire meter even now represents less than 50% of the total, while use of the 3-wire meter is increasing.

When testing 3-wire meters with the transformer type loading device, the tester and equipment are subject to the following hazards:

1. Connection of the current coils in series.
2. Possibility of closing the potential strap when the current coils are in series thus causing a short circuit.
3. Possibility of a short circuit when connecting a lead of opposite polarity to the potential strap.
4. Grounding of a current lead which would energize the transformer secondary with a higher voltage, resulting in the burn out of the resistance units in the circuit.

Install Ground Conductors By "Plow In" Method

SUBSTATION ground conductors are being "plowed-in" with a modified breaking plow of the type commonly used on the farm. Oklahoma Gas and Electric Co substation crews are most enthusiastic about their new tool which was developed by C. D. Thayer, a foreman in the construction department. The plow can be operated with winch, truck, tractor or team. Normally it is pulled with a winch line on a truck and will lay ground cable as deep as 16 in. if necessary. It has been so successful that the company has made a duplicate plow.

• • •

Circumference Reductions for Poles With Exposed Pockets

(For use with ERS NO. 50-42)

Depth of Pocket, in.	Deductions in inches to be made from Measured Circumferences for Pocket Widths of (inches)							
	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0
1.0	1	1	2	2	3	3	4	5
2.0	1	2	3	4	5	6	7	8
3.0	1	2	4	5	6	8	9	11
4.0	2	3	4	5	7	9	10	13
5.0	2	3	4	6	7	9	11	..

This year your Christmas lighting market's as big as a house!

Promote lighting for inside . . . promote it for outside!

Here's for happier holidays in your home!
GENERAL ELECTRIC
HOW TO MAKE YOUR HOUSE SAY Merry Christmas WITH LIGHT!
GENERAL ELECTRIC

GENERAL ELECTRIC's big Christmas lighting promotion is aimed at making more folks decorate with light this year than ever before.

The two big full-color ads shown above will spearhead the campaign, in Better Homes and Gardens, Life and Post. Plus spot radio and the Fred Waring Television Show. And General Electric lamp agents are being supplied with the two special point-of-sale promotion packages at the right.

It will all help to back up your own Christmas lighting promotion in your community. For help in planning a Christmas lighting Drive, call on the Lamp Department, General Electric Company, Nela Park, Cleveland 12, Ohio.

TWO BIG PROMOTION PACKAGES

One for tree lamps, which includes counter cards containing 10-lamp packages of C9½, C7½, and C6 G-E lamps, plus a streamer, tuck-in cards, and "ideas" sheet.

One for large lamps, featuring PAR-38 and 25-watt colored lamps. Has counter cards, a streamer, "ideas" sheet, and customer give-away booklets.

GENERAL ELECTRIC

LOAD BUILDING

RESIDENTIAL • RURAL
COMMERCIAL • INDUSTRIAL

TV KITCHEN STUDIO was designed to show off appliances and so three members of the cast could work without turning backs to camera too often. Some porcelain surfaces were painted a light yellow to cut down a "bloom" or glare when televised. The cast, left to right, are Shirley Jane Finley, John Roedel and Esther Lee Bride

TV Sells Electric Homemaking

ESTHER LEE BRIDE
Union Electric Company of Missouri
St. Louis

"GIVE THE WOMEN what they want, a chance to learn new, easy homemaking tricks; serve with a dash of humor . . . and watch them buy your sponsors' products." That has been the story of St. Louis' TV show "Homemaking With KSD-TV," a cooperative project of Union Electric and the station.

Careful planning was an essential ingredient, proved by test runs and changes in technique. The author was sent on a 2,000-mi trip to study television techniques at 19 stations across the country. The trip extended over the better part of three months. TV stations and station officials, utility officials and others were consulted. All of the basic information gathered went into preparation of the half hour, 5-days-a-week show.

Selection of format, selling the idea to sponsors, writing of script, timing and other problems familiar to those who have prepared radio programs were supplemented by other problems peculiar to TV. These included color selection, design of the kitchen to be used on the set, and selection of clothes to be worn by the cast. Clothes were chosen for telegenic color and fabric.

The Biggest Problem

Biggest single poser, however, was the food problem. Menus had to be "delicious, nutricious, ambitious" and composed of foods which would look appetizing through the lens. This proved to be more difficult than may be supposed. Some old favorite recipes came out of the TV camera looking like sad and neglected leftovers!

Here are some of the facts discovered regarding foods: they must contrast with the plates and table linens or be accented with contrasting "light ups" such as nutmeats, whipped cream, green peppers; they must have life—so sometimes they were brushed lightly with cooking oil before televising.

From the beginning the policy was to prepare and serve foods fancy enough to intrigue the homemaker but plain enough to make her want to fix them often. Since the complete menu —entree, vegetable, salad, dessert, and beverage—was made from sponsored products and must never be a repeat performance, considerable ingenuity was necessary to attain variety. One of the sponsors, for instance, was a cottage cheese company, and by about the eleventh week of the show inventive genius was required in dreaming up different concoctions featuring cottage cheese.

When "Homemaking with KSD-TV" opened on Jan. 23, it had three food and one appliance sponsors. Within two months, the list of food manufacturers had grown to 13. The show had proved that women buy what they can see actually used in an atmosphere which approximates their own homes. When a new type of ready-to-French-fry potatoes was introduced—and the TV show was the only advertising given this new product during the period—the response was a deluge of orders which kept the company working overtime to supply the unexpected demand.

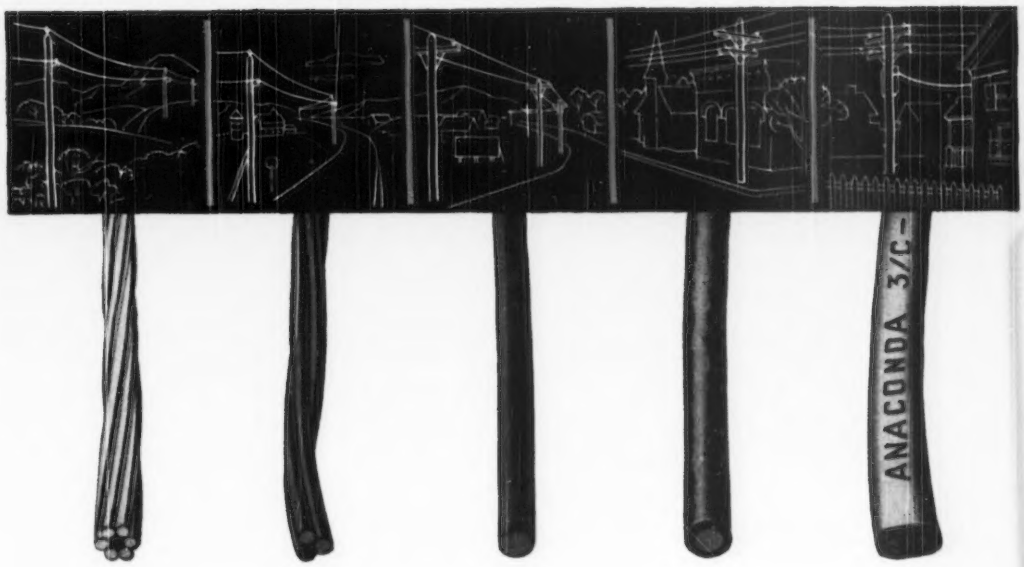
The kitchen installed in the studios had to be liveable looking, easy to work in, and telegenic. It was designed, also, to show off each electric appliance to best advantage. It was also necessary to provide space enough for the three members of the cast to move about comfortably, and an arrangement where the cast could work without turning their backs to the cameras too often.

At the end of thirteen weeks the program was well-established and Wilma Sim, who had been area director of home economics for one of the large meat-producing companies was chosen for the lead in "Homemaking with KSD-TV." This freed the author for her work in developing more daytime shows on this cooperative plan.

SEND RURAL POWER

on safe, dependable pathways!

Anaconda supplies all types of
conductors for all types of uses.



ACSR Copperweld Copper Duraline* Silvaline*

Supplying continuous power and light to farmers is a basic responsibility.

You know ANACONDA Conductors offer you outstanding service, long life and maximum safety.

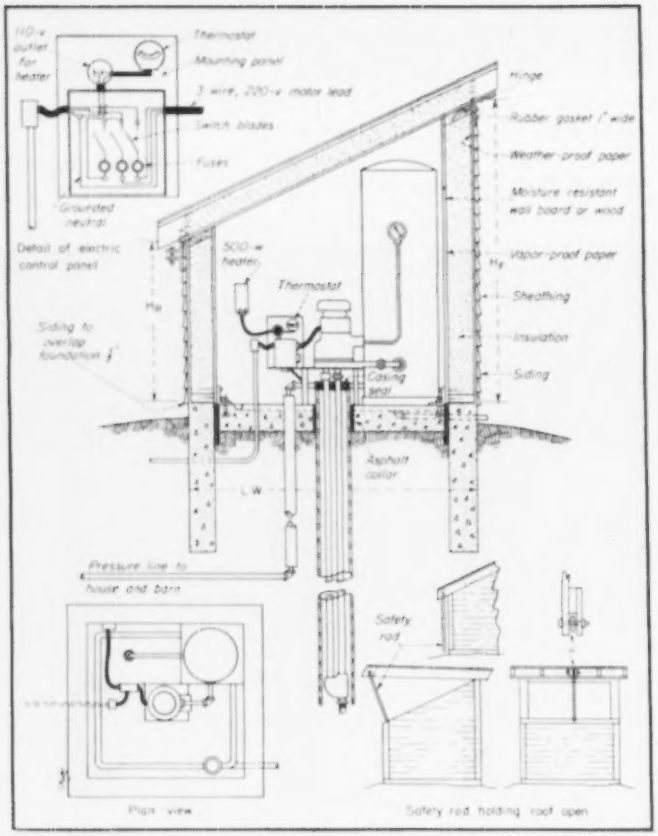
And you know from past experience that Anaconda offers you conductors for every type of rural power application with the latest technical advancements and the finest engineering cooperation.

Count on Anaconda for safe, dependable and economical pathways for power distribution wherever and whenever you need them.
Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

*Reg. U. S. Pat. Off.

The right cable for the job **ANACONDA®**

WIRE AND CABLE



ABOVE FREEZING temperatures will be maintained in insulated pumphouse which will have 500 w heater controlled by thermostat. Maximum expected energy use will be 300 kwhr

Insulate Pumphouse for Severe Winters

AN INSULATED pump house, to meet severe conditions of Minnesota winters, has been developed by the Rural Sales Dept of Northern States Power Co, C. P. Wagner, Mgr, in cooperation with the Minnesota Electrical Inspectors Association and other interested agencies. Electrically, in addition to the pump motor, these pump houses are equipped with a 500-w heater to keep the temperature above freezing at all times.

Estimates of kwhr use are difficult to reach in advance of any experience. However, Minnesota and North Dakota check tests indicate that if weather seals remain unbroken they may take no supplementary heating. In any event, it is estimated that they will not take more than 300 kwhr per season. Calculated heat loss shows that heater requirement should be 300 w and for this reason 500-w heaters are recommended in preference to the more readily available 1,000 or 1,200-w heaters. This keeps demands down and reduces wiring requirements as well.

The pumphouse is designed for use at farms, rural homes, resorts, cafes, taverns and other establishments where a year-round water system is required. It may be removed from the foundation and will meet the requirements of state and local health departments. These include location of pump above grade, not in a pit or basement, location of the pumphouse away from sewers, and a high, well-drained well site.

35 F Recommended Setting

Adjustable thermostats have a temperature range of 32 F to 45 F. Recommended setting is 35 F and thermostats preset at 35 F are available for electric heating tape or cable. It is recommended that the tape be wrapped around pipes, pump and lower part of the pressure tank. The thermostat is taped against a valve or pipe connection.

Wiring is 3-wire, 220-v and a complete wiring plan is provided with plans for the pumphouse.

Houses of different sizes are recommended for pressure tanks of different sizes. A table provided with plans give house dimensions recommended for the various sizes of pressure tanks.

Some Suggested Pump House Dimensions

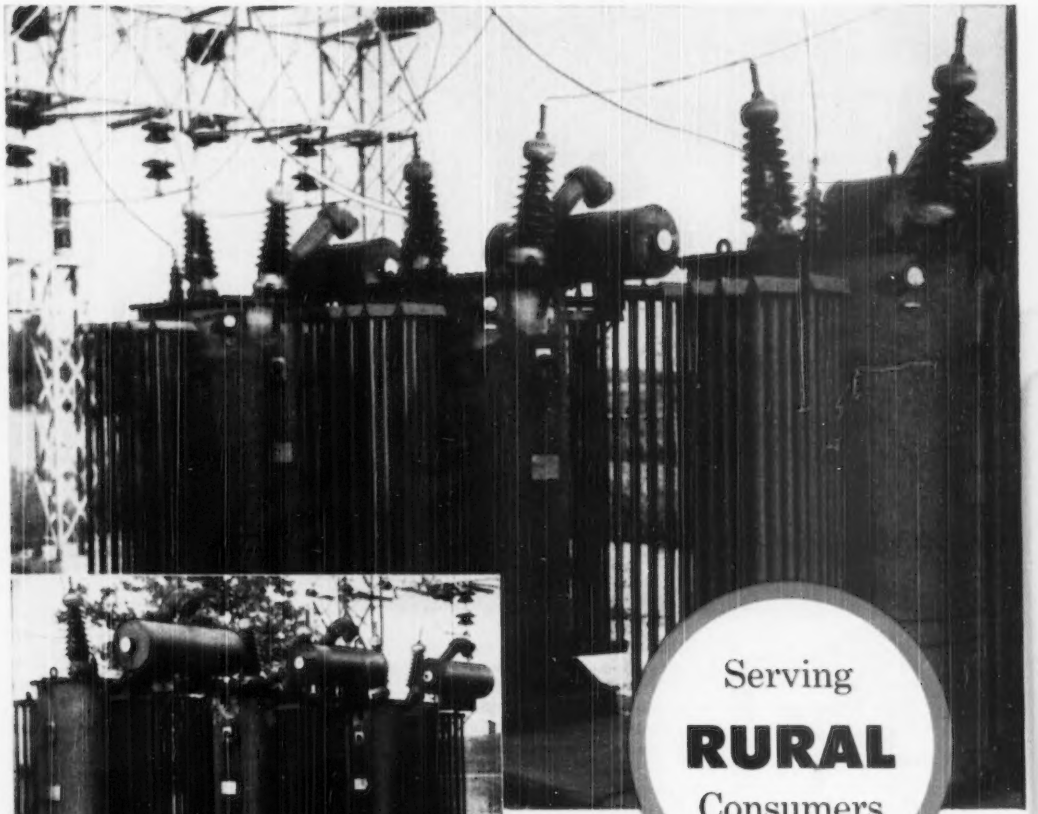
Capacity of pressure tank	Size of tank	Suggested dimensions of house			
		L	W	HR	HF
32 gal	18x30 in.	5 ft	5 ft	1 ft 9 in.	3 ft 6 in.
42 gal	16x48 in.	5 ft	5 ft	3 ft	5 ft
66 gal	18x60 in.	5 ft	5 ft	3 ft 6 in.	6 ft 6 in.
82 gal	20x60 in.	5 ft 6 in.	5 ft 6 in.	4 ft	6 ft 6 in.
100 gal	22x60 in.	5 ft 6 in.	5 ft 6 in.	4 ft	6 ft 6 in.
120 gal	24x60 in.	5 ft 6 in.	5 ft 6 in.	4 ft	6 ft 6 in.
220 gal	30x72 in.	6 ft 6 in.	6 ft 6 in.	5 ft	7 ft 6 in.

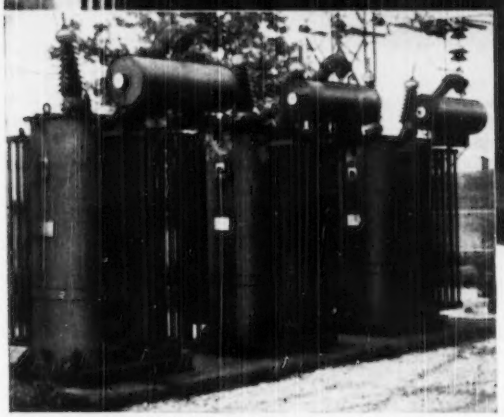
Load Building Notes

• A floodlight in the flower garden can be more than a means for enjoying the beauty of the blooms at night. We hear of a dahlia fancier who finds the hours of daylight remaining after he gets home from work and finished with dinner too short for his horticultural chores. So he turns on the floodlight and does his planting, spraying, staking and disbudding in the cool of the evening.

• Serving approximately 24,500 meals per month—lunch only—energy use for cooking in the employee cafeteria in the Ford Motor Co assembly plant at Hapeville, Ga., averages 22,229 kwhr—about 0.91 kwhr per meal. Considering the one-meal-per-day operation, and the fact that the kitchen prepares food for another cafeteria for office employees and for an executive dining room, this energy use per meal is regarded as relatively low.

Uptegraff POWER Transformers





● Two views of a 2500 KVA substation, serving rural consumers. The installation consists of three 833 KVA Uptegraff Power Transformers, OISC, single phase 66,000 volts to 7200/12470 Y volts.

Serving **RURAL** Consumers

Where transformer dependability is essential to continuity of service, you can rely upon the built-in quality of Uptegraff POWER Transformers. This has been amply demonstrated by the operating records of Uptegraff Transformers in numerous rural systems.

Design and construction details reflect extensive experience and skill in the manufacture of transformers. Uptegraff versatility and manufacturing flexibility permit the prompt delivery of transformers made to meet *your* particular requirements.

Uptegraff Power Transformers are made in sizes up to 10,000 KVA, 69 KV for indoor or outdoor service.

R. E. UPTEGRAFF MANUFACTURING COMPANY
SCOTTDALE, PENNA.

CHANCE Hot Tap Clamps

Perma-Grip Clamps

...Service proved... for all General Applications

Hold tight without sticking

Chance Perma-Grip Tap Clamps are the standard for many Companies for all general applications. They are moderately priced, yet have quality features that mean better line connections—high current capacity—high mechanical strength. U. S. S. threads screw up fast, hold tight... yet can be readily unscrewed. Perma-Grip Clamps are available for all types of connections and in a complete range of sizes.

self-lubricated types

For use in areas where special corrosive problems exist. Chance Protected Thread Clamps have a protective hood over all working parts which encloses a sealed thread chamber filled with a corrosion-resisting compound.

Flip-Tap Clamps also have a lubricating chamber. A "duck bill" guides the clamp over conductor for faster, easier application.

All Chance Clamps have high pressure, low resistance contacts.

ABC INDUSTRIES

You know it's RIGHT...

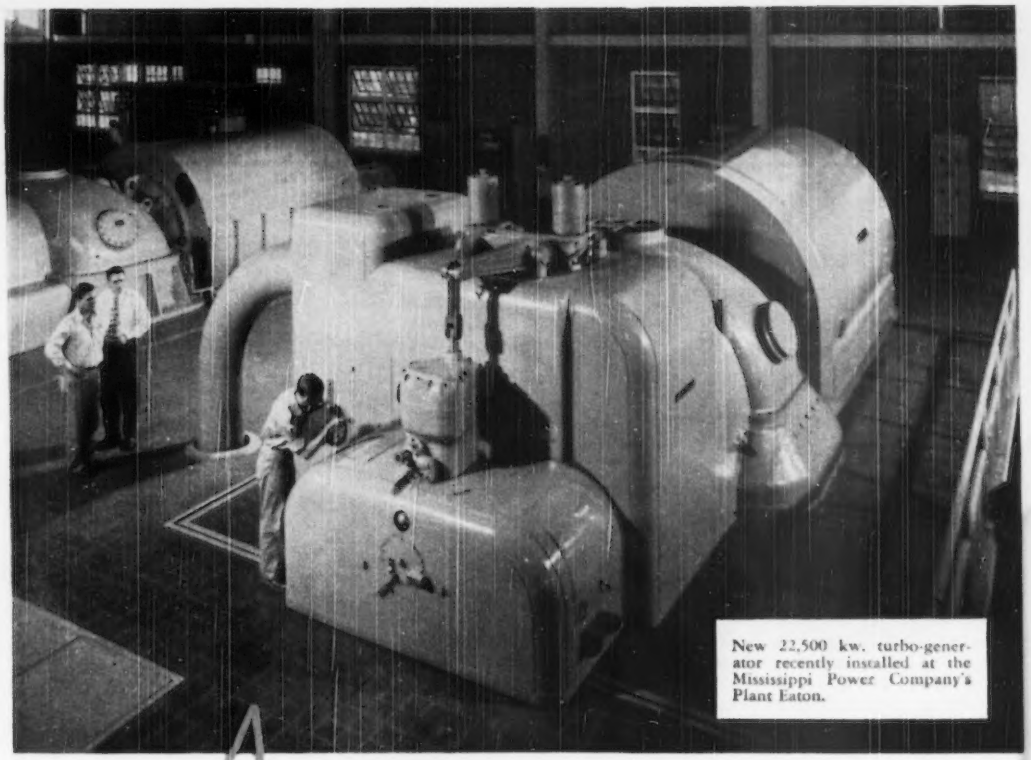
INDUSTRIAL BRIEFS

Glass Heating Panels cut preheating time of television masks before cutting at the Haberland Mfg Co, Allwood, N. J. Special ovens made from four heating panels reduce the preheating time from 5 to 2 min. Electricity consumption is less and lamp replacement has been eliminated. A total of 12 heating panels with a connected load of 12-kw is installed.

Coach Washer saves time for Seaboard Air Line Railroad Co at its Birmingham, Ala., yards. The washer, powered by 30 hp in motors, handles a train in less than 30 min which formerly required 70 man-hours to do the same job. Unique feature is that washer handles one side at a time as train is being turned on a wye. Time saved in washing allows more time for other maintenance—an important advantage, since trains operate in and out of the Birmingham Terminal on a close schedule.—V. P. Rice, Industrial Sales Dept, Birmingham Electric Co.

Surface Raceway distribution system provides sufficient capacity and flexibility for many years into the future at the Mueller-Harkins Motor Co garage at Tacoma, Washington. About 800 ft of raceway is installed in the service department and provides power for testing meters and power tools.

Electric Heat thaws earth under floor of the Rickard Frosted Food Lockers, Sullivan, Indiana. A broken moisture seal on the concrete floor allowed moisture to enter the insulation between wood and concrete floors. Zero temperature of room froze moisture and caused floor to bulge to point where damage to building was eminent. Ten one inch galvanized pipes driven under floor 6 ft apart were connected to 230 v between alternate pipes starting at 30 amp and gradually increased to 200 amp. Total consumption for operation was 5,912 kwhr. Damage was removed and customer is considering making permanent connection with thermostats in ground for automatic operation.—Carl Howard, Mgr Sullivan District, Public Service Co of Indiana.



New 22,500 kw. turbo-generator recently installed at the Mississippi Power Company's Plant Eaton.

Another progressive utility selects Gulfcrest Oil for new turbine unit

Another new turbine gets the safe, sure, long lasting protection of Gulfcrest, now more than ever the world's finest turbine oil!

Another case, too, where outstanding performance in other turbines operated by the same utility led to the selection of Gulfcrest Oil for the new units.

Extra refining makes the difference! After the carefully selected crude oil used in Gulfcrest goes through the major refining methods, it is then supperrefined by the Alchlor Process.

As much as 15 per cent of the oil is discarded by the Alchlor Process—this 15 per cent contains the hydrocarbons most apt to oxidize and form sludge, emulsifiers, and harmful acids.

That's why Gulfcrest is incomparably pure—why it gives outstanding performance, and lasts indefinitely. Call in a Gulf Lubrication Engineer today for complete information on this superior oil. Write, wire or phone your nearest Gulf office.

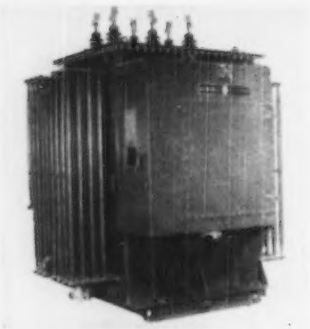
Gulf Oil Corporation · Gulf Refining Company

GULF BUILDING, PITTSBURGH, PA.

Sales Offices - Warehouses
Located in principal cities and towns throughout Gulf's marketing territory

GULF INDUSTRIAL LUBRICATION

NEW EQUIPMENT



Voltage Regulator

SWITCHING COMPARTMENT and control cabinet of redesigned MLT 32-step voltage regulators have been combined to join with the main tank. The entire switching mechanism is said to be more accessible through a larger hinged door sealed with Nitrile synthetic rubber gasket. Three-phase regulation is provided in 32 5/8% steps; ratings include sizes to 2,500 kva, 69,000 v.

Other features are these: (1) a new voltage regulating relay that reportedly has had its holding effect permanently adjusted at the factory; (2) a line-drop compensator with continuously variable resistance and reactance components; and (3) a rheostat that obviates need for an external variable-voltage source for adjusting the voltage-regulating relay. Sealed-tank type of oil preservation is used on most ratings.

General Electric Co, Apparatus Dept, Schenectady 5, N. Y.

•

Transit-Maintenance Body

ARRANGED to accommodate four men in addition to those in the truck cab, a new transit-maintenance public utility body also provides compartment space for many tools and materials. Compartments may be equipped with shelves, trays, and bins. Body roof can be fitted with hand rails and hold-down straps or equipped with ladder racks and material brackets.

Manufacturer reports that the body is particularly useful for surveying crews and maintenance gangs; also for transporting extra tools and men to large construction jobs.

McCabe-Powers Auto Body Co, Powers-American Div, 5900 N. Broadway, St. Louis 15, Mo.

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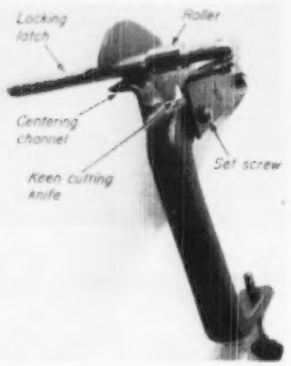

Cable Splitter

FABRIC and rubber outer insulation of series street lighting cable can be split with great time savings by a new cable splitter without the danger of using a sharp skinning knife. The knife lies in a protected channel where it can cause no injury, and where it cannot be dulled when the splitter is thrown in a tool box.

The tool is adapted for hand use by the lineman when climbing a pole, or it can be clamped on a cross arm or secured in a vise on a line truck. A hinged roller latch locks directly over the replaceable cutting knife. Cutting depth is adjustable by means of a set screw.

J. S. McConville Co, Attleboro, Mass.

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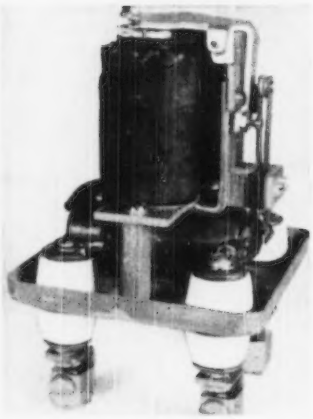
Street Lighting Relay

CONTACT of a new street lighting relay is rated to handle a street lamp load of 1,200 w. The addition of an 0.5 μf condenser across the contact



brings the rating up to 1,500 w.

A large number of these relays may be connected in parallel and operated over a single pilot wire with the same return as for the power system being used, manufacturer reports. The relay so connected may be controlled either manually or automatically by a single timer or photoelectric controller. When the relay is actuated, only about 15 ma at 120 v ac is drawn. Satisfactory operation is reported at voltages as low as 75 v.

Entire relay unit is contained in a tin-plated steel case that has been soldered to make it weatherproof. The two-hole mounting bracket is designed for pole mounting. Three solderless connectors for No. 6 flexible wire are provided.

Control Corp, 718 Central Ave, Minneapolis 14, Minn.

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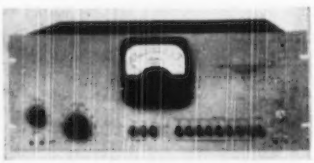


Noise Meter

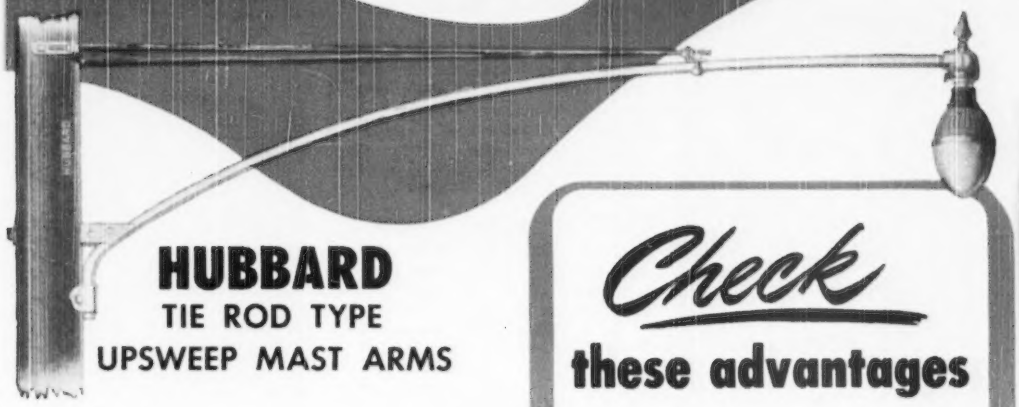
DISTORTION, noise and hum level in audio frequency equipment can be measured with the Type 35-A noise meter. With zero db input, limit of measurement is 80 db. At +40 input, limit is −115 db below input.

It is claimed that accurate fre-

beauty

efficiency

strength



HUBBARD
TIE ROD TYPE
UPSWEEP MAST ARMS

THE HUBBARD Tie Rod Mast Arm, with the famous Hubbard Keyhole design, is made in lengths of 8, 10, 12, and 14 feet, is easily installed, is well braced against side sway, and has the strength to support an extremely heavy vertical load. The ⅜-inch tie rods have 6-inches of thread at each end to allow for irregularities of mounting.

The 1¼-inch pipe will accommodate two-conductor No. 8, 6000 volt cable. Internal wiring is easy, for there are no angles, sharp bends, or obstructions.

Write for Literature

Check these advantages

- Exceptional strength . . . tie rods fastened to side of pole to minimize "sway."
- Design permits maximum elevation of luminaire.
- Meet all EEI-NEMA specifications.
- Graceful simplicity—light weight—low cost.
- "Free-flowing" internal wiring—beveled pipe ends—no sharp bends—no obstructions.

HUBBARD AND COMPANY

ESTABLISHED 1843

PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA

"Hang the Load on Hubbard Hardware!"

quency and phase adjustments are not necessary since each of eight fixed band rejection filters rejects uniformly a band of ±3% of indicated frequency. An external oscilloscope can be connected in place of the output meter. This permits determination of the relative amplitudes of the harmonics, or nature of the hum and noise, indicated on the output meter. A four-page bulletin contains complete information.

The Daven Co, 191 Central Ave, Newark 4, N. J.

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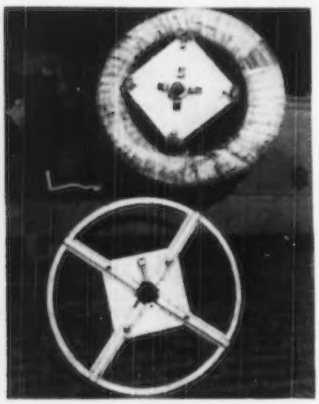

Adjustable Wire Reel

JERKS AND TANGLES are said to be eliminated by a redesigned adjustable wire reel. The reel, which can be mounted on a factory-supplied pivot to provide 90-deg swivel, fits standard wire coils.

The reel consists of a retaining plate fastened to a hub. Four adjustable supporting arms are attached to the hub upon which the coil or wire is positioned. After front retaining member is in position, the supporting arms are expanded simultaneously until all four exert equal pressure on the inside of the wire coil. An adjustable band type brake supplies sufficient drag and prevents the coil from continuing to revolve after the lineman has stopped pulling wire. Wire coils with inside diameters of from 17½ to 23½ in. are accommodated.

Line Material Co, 800 N. Eighth St. Milwaukee 1, Wis.

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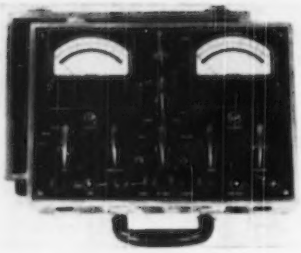
Cathodic Protection Tester

PRACTICALLY all measurements encountered in electrolysis and corrosion investigations, and cathodic-protection testing in field and lab, reportedly can be made with Model B-2 tester. The two dc instruments can be connected



into a variety of circuits for measuring potentials, current, resistance, and soil resistivity.

Among measuring circuits provided are these: Low resistance 1,000-ohms-per-v voltmeter with 10 ranges from 2 mv to 100 v; 62,500-ohms-per-v voltmeter with 6 ranges from 0.2 to 20 v; milliammeter/ammeter with nine ranges from 2 ma to 20 amp; zero-resistance type ammeter with range to 5 amp.

A circuit is included for measuring resistance of leads, bonds, shunts, flanges, etc, and for measuring resistivity of soil to any depth by the four-electrode method.

M. C. Miller, 1142 Emerson Ave, West Englewood, N. J.

•

Cable Oil Degasifier

CORRECT PRESSURE is said to be maintained within the cable by an automatic self-contained pumping system designed for extra-high voltage transmission systems requiring pipe-type, oil-filled cable. It provides a means to introduce degasified and dehydrated oil into the cable without exposure to the atmosphere.

Before the cable is filled, the insulating oil is degasified and dehydrated by a process which atomizes the oil in a high vacuum to separate volatile contaminants from the oil and prevent their re-entry. Oil in the cable is maintained at 225 to 240 psi by dual pumps. Relief valves and automatic pressure switch controls on the pumps compensate for varying electrical loads.

Pumping unit is equipped with completely automatic controls, indicators, and warning signals. These controls provide visual and audible signals for power failure, high or low oil level in the reservoir, high or low nitrogen pressure, or cable pressure, etc. There is a 7-day pressure recording device for each cable.

Bowser, Inc, Filtration Div, 1384 Creighton Ave, Fort Wayne 2, Ind.

•

MORE NEW EQUIPMENT

Just Received

Appearing Next Issue

HEAVY-DUTY FUSE CUTOUT
Protruding indicator arm shows that the fuse has blown

STRIP CHART INSTRUMENTS
Can be used for power totalization and telemeter receiver

SHORT CIRCUITING SWITCH
Allows repairs on electrolytic cell without disturbing process

CENTRALIZED SWITCHBOARD
Standard sections accommodate circuit breakers to 1,600 amp

Air Circuit Breakers

LOW VOLTAGE air circuit breakers, Types G-25 and G-50, can now be had for individual mounting. The breaker has a sheet steel enclosure formed and welded into a housing that completely encloses the breaker and cable connections. Rear portion of the enclosure, or cable entrance box, can be separated from the breaker housing.

The breakers are stated to be especially suitable for protection of lighting loads and small transformers, across-the-line starters, as back-up protection for motor starters, and as main feeder breakers on systems of 600 v ac and below, fault currents of 25,000 and 50,000 amp, continuous currents from 35 to 1,600 amp.

Allis-Chalmers Mfg Co, 932 S. 70th St, Milwaukee 1, Wis.

•

Nickel-Clad Copper Wire

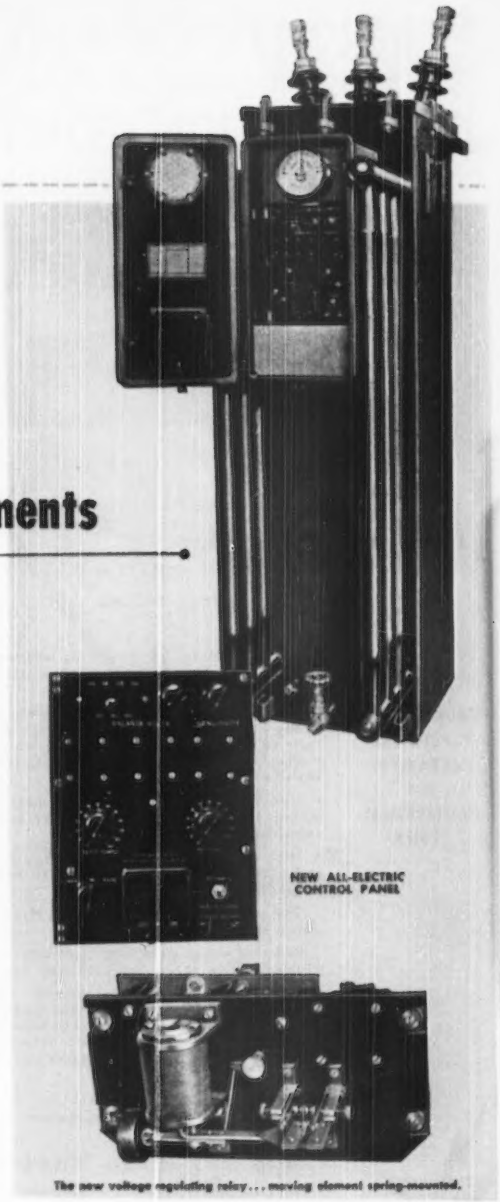
WHERE TEMPERATURE over 250 F would cause oxidation of other commonly used metals, it is claimed that nickel-clad copper wire will stand up. Suggested applications include connecting lead wires to infrared drying ovens, resistance and induction furnaces, and connecting other electrical appliances to the power source. Because of its

YOU CAN BE **SURE**.. IF IT'S

Westinghouse

More Dependable Regulation

without Mechanical Adjustments



The new voltage regulating relay... moving element spring-mounted.

Easier to operate!
Greater freedom from maintenance problems!
The new Westinghouse Induction Regulators give even more dependable regulation, with an all-electric control that eliminates mechanical adjustments.

All-electric control . . . easy to adjust:
Balance voltage and band width are determined by position of calibrated knobs and tap plug. That's all there is to it. Adjustments may be made without disturbing the line-drop compensator; either setting may be changed without interrupting service.

Rugged spring mounting eliminates delicate bearings:
Here's a nuisance maintenance problem licked! No more risk of trouble from mechanical bearings.

Spring-mounted . . . snap-action elements:
Motor operating relay has all moving parts spring-mounted, arranged to eliminate all armature impact . . . assures long life.

"Lifetime" contacts:
Another maintenance headache cured! Heavy silver contacts are designed to last the life of the unit.

Available in three models to meet all urban station requirements. Type SU, oil cooled. Type SA, air cooled. Type SI, Inerteen (R) cooled. For further information, ask your Westinghouse representative for a copy of B-4736, *Westinghouse Voltage Regulators for Urban Substations*, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

J-10351 A

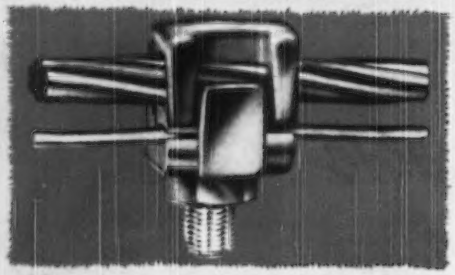
Westinghouse

VOLTAGE REGULATORS

for ANY system

NEW ONE PIECE K-90 AND K-900 SERIES DISTRIBUTION CONNECTORS

FOR ECONOMICAL FAST TROUBLE FREE CONNECTIONS K-90 AND K-900 SERIES OFFERS:



ECONOMICAL CONNECTIONS

- Low unit connector cost
- Lower installation cost
- Four sizes for connections up to 500 MCM
- Reduces inventory investment

COORDINATED ELECTRICAL MECHANICAL *and* METALLURGICAL DESIGN

Ability of design to consistently withstand mercurous nitrate test ABW Specification 124-1* which insures against seasonal cracking and stress corrosion cracking failures.

Mechanical design and alloy properties incorporating tensile and flexing characteristics consistent with maintaining high pressure contacts on varied conductor size during vibration, expansion and contraction from temperature changes. These features eliminate the necessity of a locking device.

Unique design and combination of special high strength alloys permitting higher clamping torque values being transmitted and converted into high contact pressures.

High pressure contacts which seal out formation of high resistance oxides on contact areas and lend to an equal distribution of current in conductor strands.

One piece design with interlocking clamping members which completely enclose conductors.

Perfected design permitting rapid easy method of making positive trouble free taps, splices and dead ends.

Design eliminates parts to assemble when installing. Eliminates starting threaded members. Eliminates crossed or stripped threads resulting from collapsed groove in threaded part when normal tightening torques are applied. Eliminates loosening of a properly installed connection due to vibration, temperature changes and cold flow of metals.

* Identical to ASTM B-154-45 Mercurous Nitrate Specification except ABW-124-1 specifies stressed components which is a more severe test.

Consult one of our nearest 19 representatives or contact our main office.

Write today for Bulletin K-150 on K-90 and K-900 Distribution Connectors.

ANDERSON BRASS WORKS, Inc.

POST OFFICE DRAWER 2151

BIRMINGHAM, 1, ALABAMA

• BRONZE AND ALUMINUM POWER CONNECTORS, FITTINGS, AND BUS SUPPORTS
ALUMINUM SUSPENSION AND STRAIN CLAMPS

corrosion resistance, it is suggested for fixture wire in chemical plants or plating departments.

Advantages claimed for this wire include:

1. Maximum heat and electrical conductivity 70% that of copper.
2. Does not oxidize, flake or become brittle under high temperatures during beading, stem making, sealing, and exhaust operations.
3. Welds to itself, molybdenum, tungsten.
4. Reportedly approved for 300-600-v electric range lead wire operating at 200 C.

First step in making nickel-clad copper is insertion of OFHC copper rod into pure nickel tube. This is drawn to any size from ½ to 0.002 in. diam. It is available in round and flat wire, coils or spools, and rod from ½-0.031 in. diam. About one-third the cross sectional area is nickel.

Alloy Metal Wire Co, Inc, Prospect Park (Moore Station), Pa.

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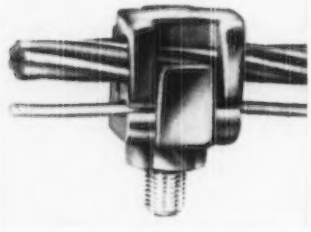


Distribution Connectors

COPPER CONDUCTOR combinations from No. 8 to 500 Mcm are accommodated with Series K-90 and K-900 bronze distribution connectors for making taps, splices and dead ends. The K-900 series incorporates a conductor spacing bar for a more even distribution of current in connections.

Manufacturer claims that design of these connectors allows transmitting and converting higher clamping torque values into high pressure contacts on conductors completely enclosed in clamping members. Flexing of clamping members free from permanent set causes retention of high-pressure contacts for sealing out oxide formation and equalizes current distribution in conductor strands during vibration or temperature changes.

Anderson Brass Works, Inc. P. O. Drawer 2151, Birmingham 1, Ala.

•

Precipitron

CONSTRUCTED for upward or downward air flow to conserve floor space, a new Precipitron electronic air cleaner

is designed to remove dust, dirt, smoke, soot, and other air-borne solids from normal air. Solid particles are charged positive, then the air passes through a set of alternately charged collector plates where the solids are removed by electrostatic attraction. It can be used in heating and air-conditioning systems, as well as for oil-mist collection.

Capacity is 1,200 cfm and up. Ninety percent of all air-borne particles traveling at 333 fpm and 85% of those moving at 400 fpm are reportedly removed. Power supply needed is 115 v, 1-ph, 50 or 60 c.

Westinghouse Electric Corp, Sturtevant Div, 200 Readville St, Hyde Park, Boston 36, Mass.

•

Incandescent Lamp

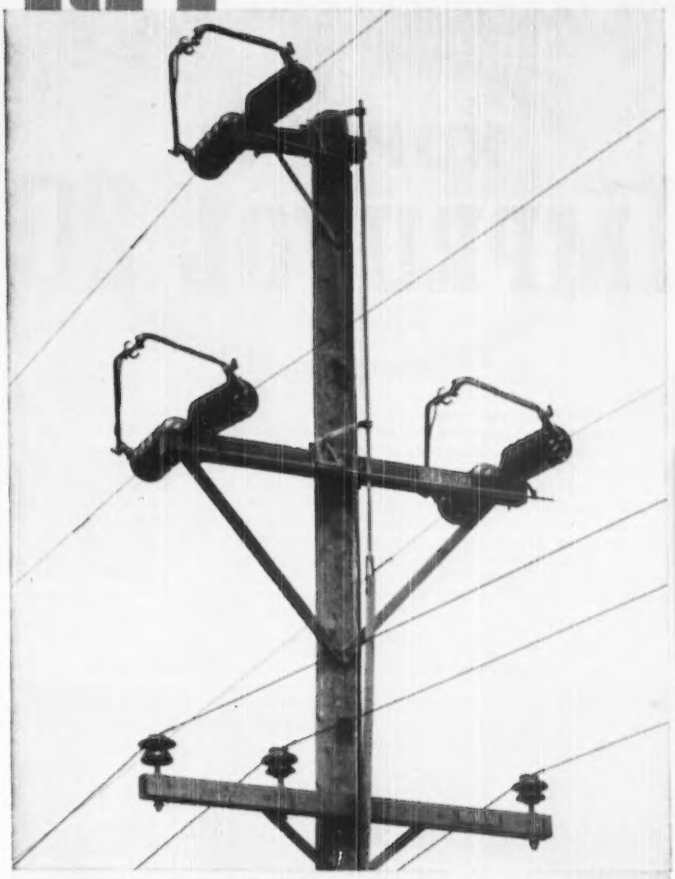
A NEW 150-w light bulb for kitchens has been announced that is no larger in diameter than a 100-w bulb, but gives half again as much illumination. Labeled "Kitchen Lite", it was developed to fill the need for a more powerful light which would fit into standard size ceiling fixtures in work areas of homes. It is rated at an average life of 750 hr, operates on 115, 120 and 125 v.

Sylvania Electric Products, Inc, 60 Boston St, Salem, Mass.

MORE NEW PRODUCTS
about which you should know

LUMENITE ELECTRONIC CO, 407 S. DEARBORN ST, CHICAGO 5, ILL., has developed an electronic liquid **level indicator** especially for oils, gasolines, and other non-conducting liquids. It is said to control and/or signal fullness or emptiness to within ⅛ in. in any tank. . . . CORNING GLASS WORKS, CORNING, N. Y., has introduced an **ultraviolet**

KPF POLE TOP SWITCHES



Simple design
means economical installation

Bore two holes in a single crossarm, tighten two bolts, attach the conductors, and the switch is installed! No separate dead-ends, no "extra" insulators required. Saves man hours, saves installation costs.

Simple design also means lower first cost, less maintenance. Insulator stacks are readily adjustable for line sag. Free-floating, self-aligning, silver-surfaced blades and jaws maintain proper contact under all conditions of sag adjustment. Switches can be used in vertical, horizontal or triangular mountings. The low-cost, trouble-free service rendered by KPF switches is attested by the many thousands in use throughout the world.

KPF ELECTRIC COMPANY
857 Howard Street • San Francisco 3, Calif.

NEW ANTIOXIDANT FOR TRANSFORMER OIL . . .

KOPPERS IMPRUVOL 20

EXTENSIVE laboratory tests indicate that Koppers new liquid inhibitor, Impruvol 20, will greatly extend the useful life of transformer oils. With the addition of as little as .5 to 1.5% of Impruvol 20, the oxidation stability of new oil is increased 5 to 15 times. Similar results are shown with reclaimed oils.

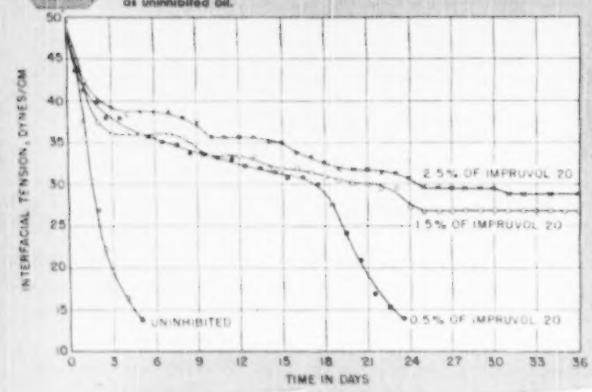
DBPC—the oxidation inhibitor that has been used in turbine oils for many years—is the active ingredient in Impruvol 20. However, the Koppers inhibitor is specially compounded, and is made into an oil solution for easy application to transformer oils. Further, Impruvol 20 will stay in the oil in the presence of water.

Study the tests shown below. They will tell you, better than words, what Impruvol 20 can do. If you are interested in improving the life of your transformer oil, write for Bulletin C-O-140, to Koppers Company, Inc., Chemical Division, Pittsburgh 19, Pa.

KOPPERS COMPANY, INC.
Chemical Division Pittsburgh 19, Pa.

KOPPERS

Interfacial Tension values under 95°C Oxidation Tests show Impruvol 20 inhibited oil impressively delayed in oxidation and at no stage as rapid as uninhibited oil.



TESTS ON A RECLAIMED OIL

	Time to Reach Sludge Stage	Increase in Oil Life
Uninhibited	2 days	—
0.5% of Impruvol 20 added	10 days	500%
1.5% of Impruvol 20 added	32 days	1,600%
2.5% of Impruvol 20 added	45 days	2,250%

TESTS ON A NEW OIL

	Time to Reach Sludge Stage	Increase in Oil Life
Uninhibited	5 days	—
0.5% of Impruvol 20 added	23 days	460%
1.5% of Impruvol 20 added	70 days	1,400%

transmitting tubing, called Black-Light Blue, which permits obtaining the lighting effects possible with fluorescent paints.

BETE FOG NOZZLE, INC, 85 PIERCE ST, GREENFIELD, MASS., has a new type of three-way **fog nozzle** that is said to extinguish oil, electrical, paint, and other types of fires. This G-5 fire nozzle can be changed from full fog to straight stream to complete shut-off by a turn of the handle. . . . MCGILL MFG CO, INC, VALPARAISO, IND., has announced Series 5000-LR **guard** which combines a lamp with concentrating lens and an outlet, in the handle, for power tools.

BENJAMIN ELECTRIC MFG CO, DES PLAINES, ILL., has announced its Magna-Flo fluorescent **lighting units** with Springlox lampholders for 96, 72, and 48-in. T-12 single-pin slimline lamps. . . . ROLATAPE, INC, 1415 14TH, SANTA MONICA, CAL., has a new unit for **one-man measurement** vertically, horizontally, or around curves. Fractions of an inch are indicated up to 2 ft; there is an audible click every 2 ft and a bell rings at the 100-ft mark.

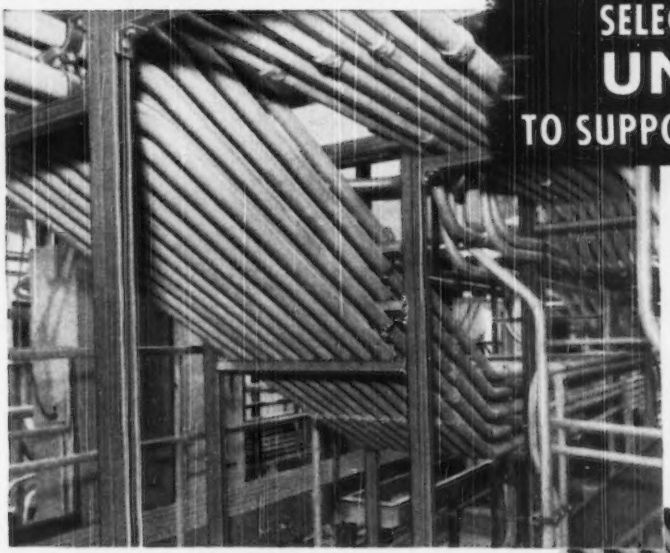
STEBER MFG CO, BROADVIEW, ILL., has added three round **column lights** to its line of square types. One addition is a six-lamp (40-w fluorescent) for mounting on existing 2-in. pipe. Bulletin 125-50 lists the complete line. . . . Steber Mfg Co also has available a new 18½-in. **reflector**. Alzak aluminum floodlight, Series 4000, in open or enclosed type, narrow or medium beam.

LYON-RAYMOND CORP, 14474 MADISON ST, GREENE, N.Y., is making a **hydraulic truck** for moving small cable reels and other materials on spools; one model has a capacity of 300 lb. . . . BLACKHAWK INDUSTRIES, DUBUQUE, IA., has a Watertite **connector** for service entrance cable, Model 600, in 1-in. and ¾-in. tapered hub sizes.

ELECTRO-MEC LABORATORY, 225 BROADWAY, NEW YORK 7, N.Y., has produced an ultra-low-torque **voltage dividing resistor** for use where an exceedingly small mechanical moving force needs to be converted into a corresponding voltage. . . . POTTER INSTRUMENT CO, INC, 115 CUTTER MILL RD, GREAT NECK, N.Y., offers a high speed electronic counter **tachometer** which will measure frequencies to 100,000 cps with an accuracy of ±1 c, according to manufacturer. It is direct reading. . . . GRAND SHEET METAL PRODUCTS CO, SAFGARD DIV, 1501 S. LAFLIN ST, CHICAGO, ILL., is making a portable electric **water heater** with a "wrap-around" heating element. Heater is available in 15 or 20-gal capacities.

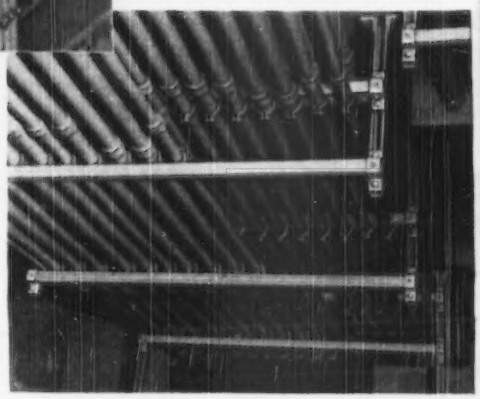
PACIFIC GAS & ELECTRIC CO.

SELECTS VERSATILE UNISTRUT TO SUPPORT CONDUIT RUNS



Completely adjustable Unistrut simplifies the most difficult problems of supporting complex conduit runs used in distribution systems—permits fast, on-the-job framing assembly where all adjustments are made by just loosening a bolt, and where supporting members are added as work progresses. No drilling, no welding, no special tools or equipment. Saves time—cuts costs. Try Unistrut on your next job to see how much quicker, better and more economically the work can be done.

Heavy rows of conduit are quickly installed and easily supported with completely adjustable Unistrut channel, fittings and clamps. Note examples of combination racking where conduit is clamped above and below to channels mounted back to back.



UNISTRUT—is metal channel with a continuous slot. You simply insert the Unistrut spring nut into the channel at approximate point where attachment of another framing member is desired, slide to exact location and bolt to Unistrut fitting. Nut is thus secured firmly to "double track" formed by inturned edges of channel to provide positive clamping action, prevent slippage.

Unistrut includes concrete inserts, pipe, tubing and cable clamps, roller pipe supports, brackets, and many other standard parts which in combination provide the world's most flexible system of support or suspension. With Unistrut you can build all types of framing, mounts, shelving, racks, tables and benches, cable, conduit and pipe hangers, fluorescent fixture supports and many other structures with only a hacksaw and a wrench. Unistrut does the complete job, you need no other parts or materials.

Write today for Free Sample of Unistrut and these Catalogs:

Catalog 500: Construction uses of Unistrut—supports, frames, mounts, etc.

Catalog 600: Materials Handling uses of Unistrut—racks, bins, etc.

THE 3 QUICK UNISTRUT STEPS

1. Insert Nut into Channel
2. Locate Fitting and Nut
3. Tighten Bolt —it's done

U. S. Patent Numbers
2327587 2380379
2363382 2345650
2329815 2405631
Other patents pending

The World's Most Flexible All-Purpose Metal Framing

Prompt Delivery from Warehouse Stocks in Principal Cities, Consult your Telephone Directories

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Please send free sample of Unistrut and catalogs checked below without obligation.

Catalog 500 ☐ Catalog 600 ☐ Unistrut sample ☐

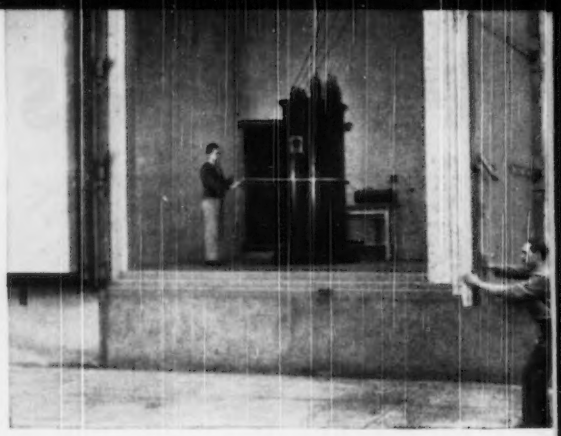
Name _____

Company _____

Address _____

City _____ Zone _____ State _____

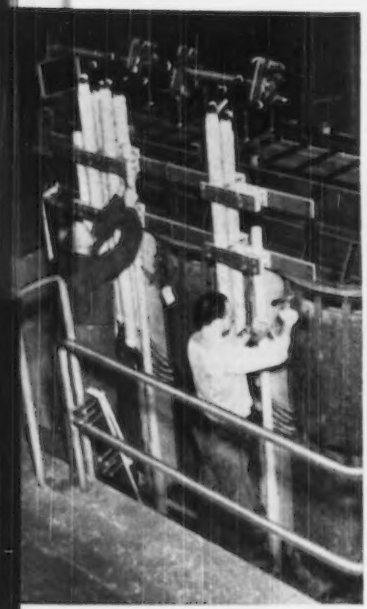
1 This attractive home in suburban Glendale is one of many served by the new 15,000 kva transformer. Since 1940 the population of Greater Cincinnati has increased over 10%. Residential Growth imposes new loads on electrical equipment as more lights and more electrical appliances draw power.



2 Research, engineering and production have teamed up at Allis-Chalmers to give you the best in quiet transformers. Here in the Pittsburgh Sound laboratory engineers make frequency, sound and harmonic analyses to help design low sound level transformers. They're putting improved performance into every type.

Cincinnati Gets More Power for Growing Residential Load

ALLIS-CHALMERS TRANSFORMER DISTRIBUTES 15,000 KVA TO CITY'S NORTH SIDE



3 Specialists complete the lead assembly. All leads are strongly supported in heavy machine wound tubes and securely braced against repeated short circuits. Ducts throughout windings and core efficiently cool transformer.

4 Radiators are made corrosion resistant by a 5-step bonderizing process and then rotary flow painted with two coats of tough, baked-on enamel. Bonderizing converts the metal surface to a non-metallic phosphate coating integral with the metal. Staggered fin arrangement makes routine periodic inspection easier.

TO THE LOOP circuit encircling Cincinnati, the Cincinnati Gas and Electric Co. engineers added 15,000 kva to meet residential power demands on the city's North side. They installed a standard Allis-Chalmers transformer at the Woodlawn substation serving the communities of Mt. Healthy and Glendale.

For Cincinnati this 66/33 kv power transformer is a good investment that will pay off in economical, long time service. Controlled gasket compression, bonderized and flow-painted radiators, side operated tap changer, basic electrical design — all part of standard low maintenance construction — involve no special engineering costs.

Cincinnati Gas and Electric Co. engineers — no strangers to Allis-Chalmers transformer reliability — have installed many A-C transformers in the last 10 years. These include power, distribution and network transformers.

Building transformers for nation's growing power load is an old and important business at Allis-Chalmers. For standard design or specialized transformer engineering, Allis-Chalmers has the background and plant facilities to produce the transformer for your system. For information or service call in your A-C sales representative. Offices in 64 principal cities.

ALLIS-CHALMERS, 932A SO. 70 ST.
MILWAUKEE, WIS.

ALLIS-CHALMERS

5 Homes in Cincinnati's suburbs, Mt. Healthy and Glendale, get more capacity for lighting and heating. This new 15,000 kva power transformer was installed to relieve increasing power demands in an expanding area. Accessories are located for maximum efficiency and convenience. Rated 66/33 kv, 3 phase, 60 cycles, the transformer has provision for forced air cooling. A-2162

NEWS ABOUT PEOPLE

Kaiser Aluminum Appoints Inch, Ready, Brown as Vice Presidents

S. S. INCH

THOMAS J. READY, JR.

DONALD E. BROWNE

Three new vice presidents have been named by Kaiser Aluminum & Chemical Corp and Kaiser Aluminum & Chemical Sales, Inc.

They are S. S. Inch, who has been general sales manager of Kaiser Aluminum & Chemical Sales, now vice president in charge of sales; Thomas J. Ready, Jr. former assistant general manager of Kaiser Aluminum & Chemical Corp, made a vice president; and Donald E. Browne, who has been controller, advanced to vice president and treasurer. Russell A. Clayton was appointed controller of Kaiser Aluminum & Chemical Corp.

All four men have been in administrative posts with Kaiser Aluminum since the company entered the industry. Inch joined the Kaiser companies in 1934 when he headed labor relations and personnel for the Columbia Construction Co at Bonneville Dam. He was with Permanente Metals Corp, Kaiser Industries, Inc, and Kaiser Co, Inc, before becoming general sales manager of Permanente Products Co, forerunner of Kaiser Aluminum & Chemical Sales, Inc.

Ready has been with Kaiser in various capacities since 1942. He served with Kaiser Co, Inc, as assistant general sales manager and administrative assistant to the general manager and administrative assistant to the executive vice president.

Browne joined the Kaiser organization in 1935. He was with the Bonneville Dam project, Henry J. Kaiser Co, Permanente Cement Co, Kaiser Co, Inc, and Kaiser Industries, Inc, before joining Kaiser Aluminum as controller. He is a member of the National Association of Cost Accountants.

•

Louis T. Matter and **Frank Baker,** former assistants to the personnel officer of Puget Sound Power & Light Co, have been made assistant personnel managers. **Clarence W. Sherman,** personnel officer, has resigned after 28 years with the company to become assistant business manager of a Seattle newspaper. **Patrick Johnson,** vice president and general sales manager, will assume the duties of personnel manager.

W. Carl Cannon Named to Presidency of CEMA

W. Carl Cannon, president and general manager of Frigidaire Products of Canada, Ltd., Leaside, Ont., has been elected president of the Canadian Electrical Manufacturers Association.

New vice presidents of the organization are K. W. Fraser, Canadian Westinghouse Co, Ltd, Hamilton, Ont.; F. C. Wallace, Smith & Stone, Ltd., Georgetown, Ont., and Fiberglas Canada, Ltd., Oshawa, Ont.; and O. W. Titus, Canada Wire & Cable Co, Ltd, Leaside. Other officers elected include H. L. Wright, Curtis Lighting of Canada, Ltd., Leaside, as secretary and L. E. Messinger, Canadian Line Materials, Ltd, Scarboro Junction, Toronto, Ont., treasurer.

Cannon was a serviceman and later dealer for Delco Light before joining Frigidaire when it started in Canada in 1927. He served as branch manager at Kingston and Ottawa and in 1931 was transferred to Toronto as sales manager there with the opening of the first Frigidaire assembly plant in Canada. Later he took charge of sales for the entire dominion and in 1942 was elected vice president in charge of sales and a director. He has been president since 1943.

•

Guido Ferrara, assistant professor of electrical engineering at the University of Detroit, has been named acting director of the department of electrical engineering. He succeeds the late Prof Harry O. Warner, who headed the department for 30 years. Ferrara joined the teaching staff at Detroit in 1946 as an instructor. Before that he had held engineering posts with Campion Laboratories, Westinghouse Electric Corp, and C. M. Hall Lamp Co.

Rear Admiral Paul L. Mather, USN (ret), has joined De Laval Separator Co, New York, as manager of the precision equipment division and special assistant to the president. He is a former administrator of the War Assets Administration and most recently has been acting member of the Federal Maritime Board.

D. W. Jardine, president of Pennsylvania Electric Co, will continue in that post although Nov 1 is the normal date for his retirement. Jardine, who has

Let us help with your steel problems

In these critical times, the problem of steel procurement is more difficult than ever. That's why we'd like to assure you that all of us here at Ryerson are ready to help you as much as we possibly can.

Our telephone girls who take your call . . . our laboratory men . . . plant men . . . sales engineers . . . delivery men—all share the job of making every effort to serve you promptly.

Because of the national emergency steel shortages are inevitable. But it is possible that many of your requirements may be among the carbon, stainless and alloy steels we have on hand for quick shipment. So for any steel need, contact your nearby Ryerson plant and we'll all work shoulder-to-shoulder to serve you.

PRINCIPAL PRODUCTS

CARBON STEEL BARS—Hot rolled & cold finished

STRUCTURALS—Channels, angles, beams, etc.

PLATES—Sheared & U.M. Inland 4-Way Safety Plate

SHEETS—Hot & cold rolled, many types & coatings

TUBING—Seamless & welded, mechanical & boiler tubes

ALLOYS—Hot rolled, cold finished, heat treated

STAINLESS—Allegheny bars, plates, sheets, tubes, etc.

MACHINERY & TOOLS—For metal fabrication

JOSEPH T. RYERSON & SON, INC. PLANTS AT NEW YORK • BOSTON • PHILADELPHIA • CINCINNATI • CLEVELAND
DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO

RYERSON STEEL

- HIGH SPEED SWITCHING UNDER LOAD enables the operator to change brightness taps without blacking out of the runway lights.
- CONSTANT CURRENT REGULATOR AND CONTROLS are in ONE compact case requiring less vault space.
- QUICK ACTING OPEN CIRCUIT PROTECTION operates in four to six cycles, thus reducing cable punctures.

- INTERLOCKED RELAYS prevent short circuiting of the windings.
- LONGER LAMP LIFE due to absence of inrush surges to lamps.

HEVI DUTY Brightness Control
REGULATORS
For Series Airport Runway Lighting

CCRBL — C.A.A. Specification L828, Sizes 7½, 15, 20 and 25 KW for medium and high intensity series runway lighting control. One compact unit includes the regulator, brightness selector contactors, open circuit protection and local control switch.

BCR811 — C.A.A. Specification L811, Size 4 KW for direct control has three position brightness and runway selector switches, auxiliary circuit breakers and positive-acting open circuit protection.

BCR812 — C.A.A. Specification L812, Size 4 KW for remote control is equipped with electrically operated relays for high speed switching, and positive-acting open circuit protection.

WRITE FOR COMPLETE INFORMATION

HEVI DUTY ELECTRIC COMPANY

HEAT TREATING FURNACES HEVI-DUTY ELECTRIC EXCLUSIVELY
DRY TYPE TRANSFORMERS — CONSTANT CURRENT REGULATORS
MILWAUKEE 1, WISCONSIN

been president since 1946, agreed to remain when the board of directors requested it because of the company's expansion program.

•

Diehl Is New President of Chase Brass & Copper

Richard C. Diehl, general manager of the Steubenville, Ohio, plants of Wheeling Steel Corp, has been elected president of Chase Brass & Copper Co, Inc. Richard L. Coe, who has been

RICHARD C. DIEHL

president, was made chairman of the board.

Diehl's entire career has been in the steel industry. He spent seven years with Armco Steel Corp at its Butler, Pa., and Middletown, Ohio, plants. With Wheeling Steel, where he has been for 15 years, he has served as assistant chief metallurgist, chief metallurgist, assistant general manager, and most recently general manager of the Steubenville plants.

Coe joined Chase in 1917 in the mills and after several years went to the sales force. He later became vice president in charge of sales and was named president last January.

•

E. F. Perkins has been appointed northern regional manager for the Pacific Coast Electrical Association with headquarters in San Francisco. He succeeds J. R. Lazarus who has resigned. Perkins spent 14 years in the domestic sales division of Pacific Gas & Electric Co and 5 years with Wesix Electric Heater Co. More recently he has been with C. A. Russell in the manufacturers' agency field.

Edward J. Rommel, former sales counselor for Commercial Electric Co, Toledo, has been appointed assistant to the commercial manager of Dayton Power & Light Co. He will be in charge of the administration of power

KEEP METAL SURFACES AND CONTACTS *CORROSION FREE* WITH NO-OX-ID "A SPECIAL"

It's a simple matter to eliminate formation of oxides, sulphides and other corrosion deposits on metal surfaces and contacts. Just coat the part with NO-OX-ID "A Special" . . . the Dearborn rust preventive of a hundred uses in the utility field.

NO-OX-ID "A Special" is a heavy duty, chemically inhibited compound recommended by manufacturers to provide trouble-free joint connections . . . impervious to weather, corrosive fumes, high humidities, water immersion. It is economical to use, easy to apply, easy to remove.

Check the advantages of NO-OX-ID "A Special." Put it to profitable use in your shops . . . on maintenance and repair trucks. Mail the coupon for further, helpful information.

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Bus bars	Steel conduit
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Aluminum cable	Wire
Connectors	Aerial cable
Clamps	Turnbuckles
Steel light poles	Manhole hardware

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THE ORIGINAL RUST PREVENTIVE
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IRON + RUST

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Chicago 4, Illinois

Gentlemen: Please send booklet on NO-OX-ID "A Special."

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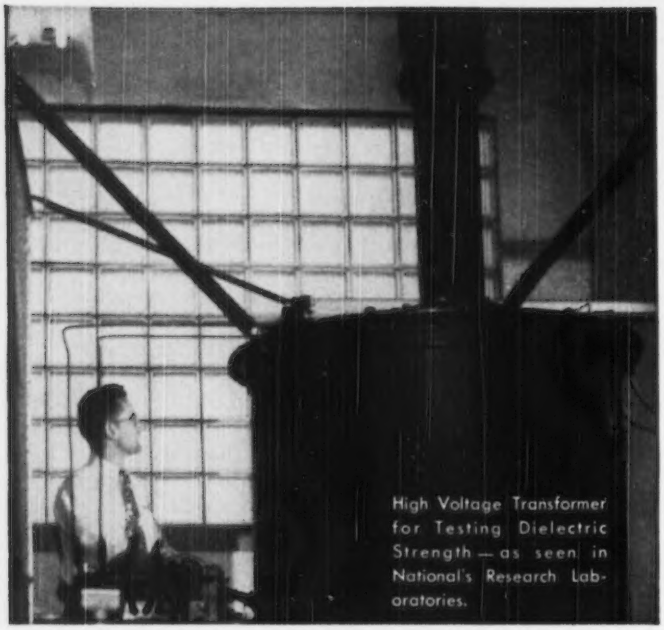

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Improved Profitable Products

National, not only carries on a continuing quality control program in the manufacture of National Vulcanized Fibre and Phenolite to assure adherence to rigid specifications, but, is constantly seeking improvements in these products for the advancement of industries where plastics practically perform.

It will pay you to use—

NATIONAL VULCANIZED FIBRE

A tough, horn-like material with high dielectric and mechanical strength. Excellent machinability and forming qualities, great resistance to wear and abrasion, long life, light weight. Sheets, Rods, Tubes, Special Shapes.

PHENOLITE Laminated PLASTIC

About one-half the weight of aluminum, possesses an unusual combination of properties—a good electrical insulator, great mechanical strength, high resistance to moisture; ready machinability. Sheets, Rods, Tubes, Special Shapes.

National Research and Engineering Service are available to you, without obligation—to help you solve your specific development problem. Write us—

NATIONAL VULCANIZED FIBRE CO.
WILMINGTON DELAWARE
Offices in Principal Cities
Since 1873

sales and rural sales activities. Before joining Commercial Electric he spent 21 years as distribution engineer with Toledo Edison Co.

R. A. Juusola has been appointed plant manager for the weld, wire, and small parts operations of the Parts Division of Sylvania Electric Products, Inc. Juusola joined Sylvania in 1941 and has been with the Parts Division at Warren, Pa., since 1944, most recently as supervisor of industrial engineering.

•

Paxton Made GE VP; Crawford Is Promoted

Robert Paxton, recently named manager of manufacturing policy for General Electric Co (EW, Sept 25, p 144), has been elected a vice president. He formerly was manager of the Transformer and Allied Product Divisions.

James M. Crawford will succeed Paxton in Pittsfield. He has been manager of the department's Large Motor and Generator Divisions.

Crawford joined GE in 1922 as a test engineer. Later he served as assistant superintendent of the motor and generator manufacturing division, assistant superintendent of the turbine manufacturing plant at Syracuse, N. Y., assistant superintendent of the Schenectady Works testing division, and assistant to the works manager. When the various product divisions of the Apparatus Department were established in 1947, he was appointed manager of the Large Motor and Generator Divisions. He received the Charles A. Coffin Award for his work in providing facilities for evacuation, charging, and testing of refrigerator units.

•

David N. Merrell, residential sales manager for the northern division of Ohio Power Co, has been made manager of the Fostoria district of the company. Merrell has been with the utility in Tiffin for 20 years. He succeeds **Charles E. Campbell**, retiring after 20 years as Fostoria district manager.

E. S. Haymond, treasurer of West Penn Power Co, has been elected assistant secretary. He will retain his treasurer's post. Raymond has been with West Penn almost 30 years as statistician, assistant treasurer, and treasurer.

Walter C. Beckjord, president of Cincinnati Gas & Electric Co, has received the University of Minnesota's Outstanding Achievement Medal Award for former students of the university "who have attained high eminence and distinction." A former president of the

News about steel

FROM U·S STEEL SUPPLY

GRAY MARKET ??

● Benjamin F. Fairless, President of United States Steel Corporation, recently re-affirmed the sales policy of the Corporation and all its subsidiary companies. He said: "Corporation policy . . . continues to be to sell steel *only to bona-fide customers* at *regular* published prices. We will decline to make sales to any purchaser who is found to have resold in the gray market, steel bought from the Corporation."

We know that you, as a steel buyer, are equally interested in making sure that outlets for steel entering the gray market are blocked. Success in this effort depends entirely upon the cooperation of all patriotic business organizations. The gray market siphons steel out of regular supply channels, and if we all help to curb this traffic there will be *more* steel available at published warehouse prices.

All employees of the United States Steel Supply Company, and especially our sales force, are exercising their best judgment in accepting and filling orders for steel. Inquiries are carefully scrutinized to insure equitable distribution to bona-fide steel users.

Be sure to contact us about your requirements. We'll do our best to provide you with the steel you need.

Principal Products: Carbon, Alloy and Stainless Quality Steels Aluminum · Reinforcing Bars · Tools · Supplies and Machinery

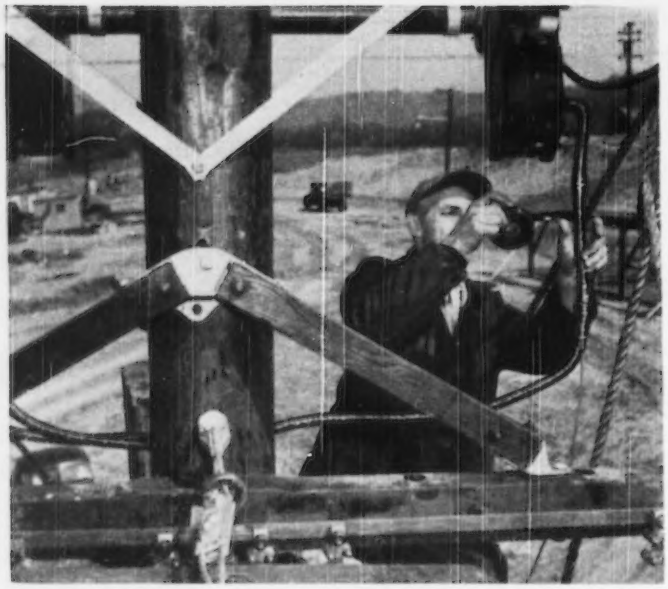
WHEN YOU DEAL WITH US, YOU GET Service Plus!

UNITED STATES STEEL SUPPLY COMPANY

Warehouses and Sales Offices: BALTIMORE · BOSTON · CHICAGO CLEVELAND · LOS ANGELES · MILWAUKEE · MOLINE, ILL. · NEWARK · PITTSBURGH PORTLAND, ORE · SAN FRANCISCO · SEATTLE · ST. LOUIS · TWIN CITY (ST. PAUL) Sales Offices: INDIANAPOLIS · KANSAS CITY, MO. · PHILADELPHIA · ROCKFORD, ILL. · TOLEDO TULSA · YOUNGSTOWN

Headquarters Offices: 208 S. La Salle St.—Chicago 4, Ill.

UNITED STATES STEEL



WEATHER-PROOFING 2300 volt, rubber-covered conductor with "SCOTCH" Electrical Tape No. 22

Boiling sun, freezing cold, rain, sleet—

This tough plastic tape defies them all

At Cincinnati Gas & Electric Company's new substation the high voltage cables and leads are thoroughly protected with "SCOTCH" Electrical Tape No. 22. This tough, stretchy tape molds snugly around all joints, curves and uneven surfaces. Seals out weather.

It's compact, too, with high dielectric strength — one layer half-lapped withstands over 10,000 volts. Smooth backing resists abrasion—is unaffected by oil, water or corrosive vapors.

And "SCOTCH" Electrical Tape No. 22 gives a neat job. Pressure-sensitive adhesive speeds application, cuts costs.

You can save money with one of the many "SCOTCH" Electrical Tapes. Write Dept. EW-100 and tell us about your insulating problem. No obligation, of course.

Made in U. S. A. by MINNESOTA MINING & MFG. CO., St. Paul 6, Minn., also makers of other "Scotch" Brand Pressure-sensitive Tapes, "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-Slip Surfacing, "3M" Abrasives, "3M" Adhesives. General Export: Durex Abrasives Corp., New Rochelle, N. Y. In Canada: Canadian Durex Abrasives Ltd., Brantford, Ontario.

American Gas Association. Beckjord has served as an executive and director of several utilities, including American Light & Traction Co, Boston Consolidated Gas Co, and Columbia Gas & Electric Co.

John C. Gibbs has been appointed assistant to the president of Citizens Utilities Co. Gibbs has been plant manager for Servo Corp of America, manufacturer of electrical controls and communication equipment. Earlier he was with General Electric Co and Consolidated Gas, Electric Light & Power Co of Baltimore. For Consolidated he served as assistant engineer and later assistant to the technical engineer in the utility's inter-system power utilization bureau.

Herbert T. Senseman, manager of the former Lemoyne district of Pennsylvania Power & Light Co, has been named district manager of the new Cumberland district formed by combination of the Carlisle and Lemoyne areas. Headquarters of the new district will be in Carlisle. Senseman has been in the power industry since 1921, when he joined the former United Electric Co and Valley Traction Co as a commercial agent.

Burton S. Grant, former assistant chief engineer of the water works of Los Angeles' Department of Water and Power and a department employee for 25 years, has been named deputy general manager of the department and chief engineer of the water works. He succeeds **Laurance E. Goit** who was made principal water works engineer when he requested the change for reasons of health.

Donald E. Bootes has been appointed home service director of Dayton Power & Light Co, succeeding **Mrs. Kathleen Bergdoll,** who has resigned. He will supervise the home service and home lighting staffs. Bootes joined the utility in 1941 and has recently been a supervisor in the accounting division.

Edwin P. Brown, superintendent of the Westmount, Que., municipal light and power department, will retire April 1 after 45 years of service.

OBITUARY

Otis W. Pike, 51, manager of engineering of the Tube Divisions of the General Electric Co Electronics Department, died Oct 7. A member of AIEE, a fellow of the Institute of Radio Engineers, and chairman of the Joint Electronics Tube Engineering Council, he had been with GE since 1920.

"Why am I an Orphan?"

...said the small-boiler operator

He was in a pretty tough spot. *Sure*, he wanted to collect his fly ash. But how could he afford a custom-engineered fly ash collector for a boiler under 2000 BHP? He *hated* to think of installing *anything* short of a real fly ash collector!

Could we help? Simple... just tell him about the new Buell 'LR' (Low Resistance) Fly Ash Collector!

SPECIALLY DESIGNED FOR SMALL BOILERS

The cost of the 'LR' Fly Ash Collector fits the smaller plant's budget nicely. Yet the 'LR' is guaranteed to collect 99% of all 100-mesh cinder discharge. And the draft loss is so low you can even use the 'LR' on a *natural draft* boiler!

Practical? The 'LR' is chunky, compact... made to fit a small plant's boiler room. And there's no cleaning, no water, and no maintenance except emptying the hopper!

If you run a coal-fired boiler between 100 and 2000 BHP, write for complete facts on Buell's new 'LR' Fly Ash Collector. Buell Engineering Company, Suite 5050, 70 Pine St., New York 5, N. Y.

buell

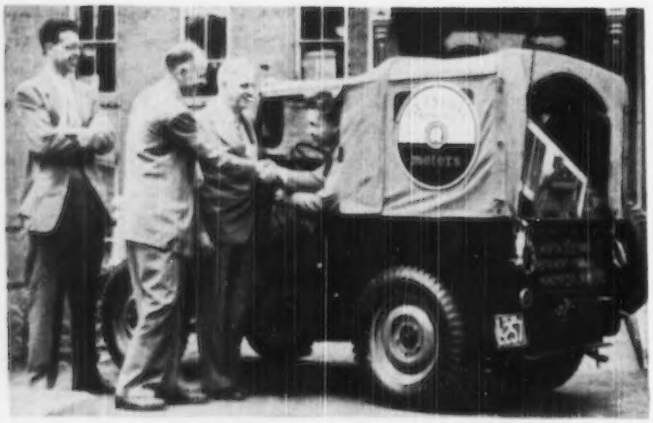
Engineered Efficiency in

Fly Ash Collection

'LR' for small boilers

WE'LL BE AT **BOOTH 72**
AT THE POWER SHOW
Grand Central Palace
New York City...
NOV. 27 to
DEC. 2

MANUFACTURERS and MARKETS



TRAVELING EXHIBIT of Marion Electric Instrument Co, Manchester, N. H., demonstrates new line of electrical indicating panel instruments and other testing devices. Mounted in steel sleeves, instruments bounce, slide, and tumble as they would in the field. Jeep will visit hundreds of industrial plants in nationwide tour that began recently

NPA Sets up Formula to Spread Defense Orders in Steel Industry

Soon you can expect almost day-to-day information on the amount of steel and other critical materials going into military uses.

The National Production Authority has set up a procedure for spreading certified defense orders ("DO" or priority orders) equitably among steel producers. The formula lets any steel producer reject a priority order if he already has priority orders over and above certain specified percentages of his average monthly shipments during the first eight months of 1950.

The records of DO's received and shipments made will give industry officials and government administrators their first direct information on the exact impact of military orders for scarce materials. The formula is expected to be spread to aluminum, copper, and other critical materials in the next few weeks.

The new order is, in effect, a detailed directive to the steel industry telling it how to apply NPA's "Regulation No. 2." That's the general order that gave the military and the Atomic Energy Commission authority to put priority ratings on their contracts. Then it became mandatory for suppliers to fill the DO ahead of all other business. But the regulation raised a lot of obvious questions.

The recent order gives some of the answers for steel—and it's the tipoff on the answers that will be given to the same questions when they arise in the other industries producing critical materials:

Steel mills don't have to accept a DO that calls for delivery in less than 45 days, roughly. (They may if they choose to, of course.)

A mill doesn't have to take a DO for any carbon steel item if its DO's for delivery in any month already total 15% of its average monthly shipment of carbon steel products during the first eight months of this year.

On alloy steel the overall limit is 25%.

Inside these general ceilings there are specific percentage rejection points for particular items, ranging from 5% for carbon wire rods, wire, and wire products to 25% for alloy wire rods and wire.

The Washington experts—backed by the steel executives who advised them—say this gives the military plenty of room. They figure it will be a long time yet before the mills start bumping their heads against these ceilings.

Up to now they've had to take expert guesswork on this. When the DO ratings are finally pinned on the military orders that are actually in the works, they will know for sure.

•

Hotpoint House Offers Pushbotton Operation

The Hotpoint House of the Fifties, described as the most electrified home ever built, was opened last week at Plandome Mills, N. Y.

Sponsored by Hotpoint, Inc. and its New York distributor, General Electric Supply Corp, the house will be used as a pattern for demonstration homes in various price brackets to be built at key points throughout the country. More than 20 national manufacturers supplied equipment.

The all-electric Hotpoint kitchen and laundry contain matched appliances that operate automatically by push-button or dial controls. Laundry equipment is arranged for assembly-line performance so that clothes move from hamper to automatic washer to electric dryer to ironer.

Kitchen appliances include a double-oven electric range operated by push-buttons that light up in different colors to show desired heat settings, a combination refrigerator-freezer with separate compartments for each purpose, and an automatic dishwasher-sink equipped with a food waste disposal.

Low-voltage wiring makes possible remote control of most of the equipment. Every light in the house and exterior floodlights can be turned on by pressing buttons at four locations. A button in the master bedroom will turn on the electric coffee percolator in the kitchen.

The rear of the house is enclosed with picture windows that can be lowered electrically, giving access to a

BOTH CARRY 390 AMPS.

BUT ROCKBESTOS

A.V.C.®

IS 43% SMALLER

With higher-rated A.V.C. and a 390 ampere load INSTALLED COSTS ARE LOWER*—

- you use a 400 MCM cable *not* 700 MCM
- you use 3″ conduit *not* 3½″
- you use *smaller* fittings and lugs
- you have *lower labor costs* because smaller, lighter cable and conduit are quicker and easier to handle.

Size for size A.V.C. has a HIGHER AMPERE RATING

. . . YOUR BEST BUY

Permanently-insulated Rockbestos A.V.C. can save you money. Write for the booklet "Cut Current Carrying Costs."

*Comparison with Type RH based on Chapter X—National Electrical Code, 40ºC-104ºF Ambient

ROCKBESTOS A.V.C.

ROCKBESTOS PRODUCTS CORPORATION
New Haven 4, Connecticut

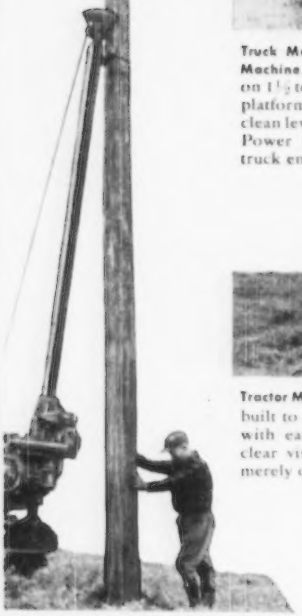
NEW YORK • CLEVELAND • DETROIT • CHICAGO • PITTSBURGH
ST. LOUIS • LOS ANGELES • OAKLAND, CAL.

In clay, hardpan, shale or frozen ground . . .

they dig holes and set poles

Truck Mounted Model HD Earth Boring Machine. Light enough for mounting on 1½ ton truck. Operates from truck platform providing clear vision and clean level place for operator to stand. Power furnished boring unit from truck engine.

Tractor Mounted Model HD Earth Boring Machine. Compactly built to reach any location. Operator stands on ground with easy access to power leveling device and with clear vision of auger. Can stop digging operation by merely opening hands and releasing levers.



A 2500 pound capacity winch and a pole derrick to handle 40′ to 45′ poles can be furnished as optional equipment. No separate drive from truck engine needed.

Both Models Have These 6 Features

1. Digs holes 9″ to 20″ diam., 7′ to 10′ deep.
2. Compact and rugged in design.
3. Powerful enough to dig in all soil conditions, except solid rock.
4. Integral winch and pole derrick.
5. Auger bar and pole derrick lifted from travelling to working position by power.
6. Quickly adjusted to dig at any angle.
7. All gears enclosed in oil.

HIGHWAY TRAILER COMPANY

Headquarters: Edgerton, Wisconsin

PLANTS AT EDGERTON, WISCONSIN—STOUGHTON, WISCONSIN, CINCINNATI, OHIO

Manufacturers of Utility Truck Bodies • Earth Boring Machines • Pole and Cable Reel Trailers • Winches • Power Take-offs • Service Accessories

screened terrace. An indoor solarium with electrically heated soil allows the owner to have a year-round flower garden. In a recreation room adjoining the living area are the greenhouse, a television center, and a soda bar that produces its own charged water.

Automatic air conditioning, space heating, and water heating equipment, thermostatic heating controls, and an intercommunication system also are included. Of a size that normally would require servants, the Hotpoint House will be practically self-sufficient with its variety of work-saving equipment, the sponsors say.

MANUFACTURING BRIEFS

Officials of the Mechanical Education Society of America have accepted Revere Copper & Brass's offer of 10¢ hourly wage boosts for the company's 4,200 employees at its two Rome plants. Acceptance is subject to ratification by the union's members. Employees at the two plants recently staged a series of walkouts in support of demands for wage increases. The contract between Revere and MESA does not expire until next June.

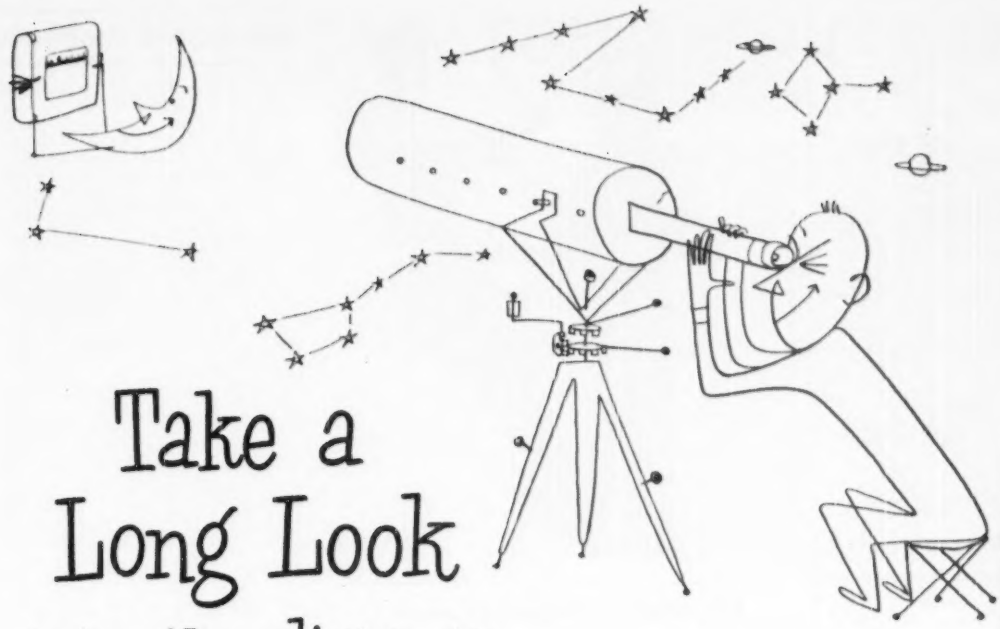
Two adjoining buildings for warehouse and sales office space in Atlanta, Ga., are being built by Minnesota Mining & Manufacturing Co, St. Paul. The warehouse will cover 10,000 sq ft and the office building about 2,500 sq ft. Both units are expected to be ready for occupancy about Jan 1.

Sterling Electric Motors, Inc, Los Angeles, builder of electric motors, will build a branch plant on an 11-acre site at Van Wert, Ohio. The factory is expected to be in operation by Jan. 1.

Production workers at Sangamo Electric Co, Springfield, Ill., have agreed to accept a wage proposal calling for a 10¢-an-hour boost as of Dec. 4. Five cents of the increase is retroactive to July 10 and 3¢ to Sept 4. The pact also includes a more liberal vacation plan. It is not subject to renegotiation before the contract expiration date, next April 1.

Metal Prices
Oct. 16, 1950

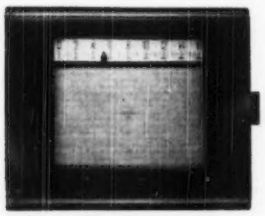
COPPER, Conn. V., lb	$ 24½
LEAD, N. Y., lb	16
ZINC, prime Western, E. St. Louis, lb	17½
TIN, Straits qual, N. Y., lb	1.11½
ALUMINUM, ingot, base price	.18
NICKEL, base price	.48
STEEL, billets, Pitts., ton	53.00
STEEL scrap, No. 1 heavy, Pitts., ton	44.00



Take a Long Look into the distance

and see the facts you need for high efficiency

Bristol's Metameter System of Telemetering gives an accurate, up-to-the-minute account of conditions at remote points . . . enables you to anticipate abnormalities . . . prevent emergencies.



Bristol Strip-Chart Metameter Receiver

Used by load dispatchers of central station systems for readings of:

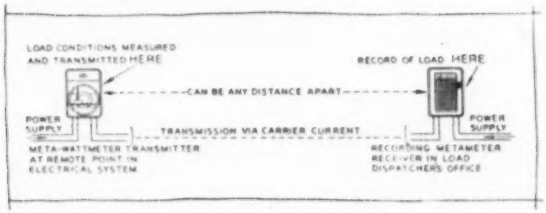
- load at each tie-line point
- output of each generating station
- totalized output (on a single instrument) of all generating stations
- active and reactive power and power demand at key points
- voltage and current at various points

And by operators of generating stations for readings of:

- output of each associated station —attended or unattended
- total output of generating station
- water level and waterwheel gate position
- water level—reservoirs, surge tanks, etc.

Readings can be transmitted any distance over any two-wire circuit or its equivalent—carrier-channel, telephone, telegraph or radio (including microwave) . . . to recording receivers (narrow or wide-strip chart or round chart) or indicating receivers with illuminated dials.

Write us for Bulletin M1700. THE BRISTOL COMPANY, 116 Bristol Road, Waterbury 20, Conn.


LOAD CONDITIONS MEASURED AND TRANSMITTED HERE
RECORD OF LOAD HERE
CAN BE ANY DISTANCE APART
POWER SUPPLY
TRANSMISSION VIA CARRIER CURRENT
POWER SUPPLY
META-WATTMETER TRANSMITTER AT REMOTE POINT IN ELECTRICAL SYSTEM
RECORDING METAMETER RECEIVER IN LOAD DISPATCHERS OFFICE

BRISTOL

Gives You the FACTS When and Where You Want Them

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

Has What It Takes

For Guys, Messenger and Overhead Ground Wire

EXPERT linemen know, when they use *Crapo* Galvanized Steel Strand, that it will meet every requirement the job demands. For *Crapo* Galvanized Strand "has what it takes" — *strength, ruggedness, workability, long-life.*

These essential characteristics, combined with ever important ECONOMY, make *Crapo* Galvanized Strand first choice for guys, messenger and overhead ground wire. The superior tensile strength of the steel is utilized to fullest advantage in each size and grade. The heavy, ductile, tightly-adherent galvanized coating — applied by the famous *Crapo* Process — provides dependable protection for the steel, prolongs the expectant life of the strand.

The all 'round reliability and overall economy of *Crapo* Galvanized Strand are matters of record with leading strand users. Such records contain ample and significant proof of the long life and low annual cost of this strand in service.

Available for Prompt Delivery

There is a size and grade of *Crapo* Galvanized Strand for every practical need. Consult the distributor of *Crapo* Galvanized Products near you or write for further information!

INDIANA STEEL & WIRE COMPANY
MUNCIE, INDIANA

Crapo GALVANIZED STEEL STRAND

NEW ELECTRICAL CONSTRUCTION

NEW ELECTRICAL construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is included

UTILITIES

Proposed Construction

Arkansas—U. S. Eng., 300 Broadway, Little Rock, furnishing oil circuit breakers, disconnect switches, spare parts for Norfolk Dam, Cotter, CIVENG 03-850-51-18.

Calif., San Carlos—Lenkurt Electric Co., San Carlos, electronic mfg. plant addn. **$100,000.**

Colorado—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping point or f.o.b. cars Walt Siding, Colo., control system, conduit sections, portal sleeve, anchor bolts and butterfly valve base for Carter Lake Pressure Tunnel, Estes Park-Foothills power aqueduct, Colorado-Big Thompson Proj., Spec. DS-3215. L. N. McClellan, ch. engr.

Fla., Jacksonville—City, City Hall, three 3000 kva sub-stations complete with feeder cables for outdoing service for West Beaver St., Lake Shore and Venetia. Reynolds, Smith & Hills, 227 Park St., Zone 1, engrs.

Georgia—Coastal Electric Membership Corp., Midway, 42.11 mi. rural distr. lines in McIntosh, Liberty and Bryan counties. Plans deposit $10. Paterson & Dewar, Rutland Bldg., Decatur, engrs.

Ind., Terre Haute—Public Service Co. of Indiana, Inc., Trac Terminal Bldg., Indianapolis, power plant, **$10,000,000.** Sargent & Lundy, 140 S. Dearborn St., Chicago, 3, Ill., consult. engrs.

Ky., Lexington—Kentucky Glass Works of General Electric Co., Russell Cave Pike, 33,000 sq. ft. incandescent bulb plant, **$750,000.**

Michigan—Detoit Edison Co., Paul W. Thompson, eng. vice pres. 2000 Second St., Detroit, 400,000 hp. generating plant on St. Clair River between St. Clair and Marine City, **$35,000,000.**

Missouri—Gascosage Electric Co-operative, Dixon, 91.50 mi. rural distr. lines in Miller, Maries, Phelps and Pulaski Counties, $160,000, Frank Horton & Co., Lamar, engrs.

Nebraska — Consumers Public Power Dist., Columbus, imprv. Chadron-Crawford lines with new tie lines, sub-stations and adnl. equip., **300,000;** rebuild Ogallala-Big Springs transmission lines and provide sub-station, **$135,226;** rebuild Chadron-Rushville lines to handle 115,000 volt operation, **$190,000.** R. L. Schacht, c/o owner, ch. engr.

New Mexico—Springer Electric Co-operative, Springer, 95 mi. 69kv rural distr. lines, three 1,900 kva sub-stations, 378 mi. rural distr. lines and sys. imprvs., Colfax Co. **$1,170,000.**

New Mexico—Bureau Reclamation, Dpt. Interior, Elephant Butte, construct Socorro-Albuquerque 115 kilovolt transmission line, Rio Grande Proj., 3-phase, single circuit, woodpole, H-frame type, approx. 80 mi. long. Spec. No. DC-3206.

N. Y., Islip—Civil Aeronautics Admin., Federal Bldg., New York International Airport, Jamaica, transmitter bldg. and glide path bldg. and associated work at MacArthur Field.

North Dakota—Bureau Reclamation, Dpt. Interior, Bismarck, construct 10,000 kva Lakota and 10,000 kva Valley City substations, Missouri River Basin Proj., Transmission Div. Spec. R6-606C-50.

Okla., Pryor—City, electric distr. sys. **$180,000.**

Oregon—West Oregon Electric Co-operative, Veronia, 32 mi. rural distr. lines, 2 sub-stations, 35 mi. rural distr. lines and sys. imprvs., Columbia Co. **$145,000.**

South Dakota—Morgan Grand Electric Co-operative, Timber Lake, 1,067 mi. rural distr. lines, two-way radio and completion of previously aproved construction in Dewey and nearby counties. **$1,300,000.** Scott Eng. Co., Watertown, consult. engr.

Tennessee—Tri-State Electric Co-operative, Copperhill, 244.5 mi. rural distr. lines, Fannin, Polk and Cherokee Counties. Plans deposit $10. Patterson & Dewar, 208 Rutland Bldg., Decatur, Ga., engrs.

Tex., Beaumont—Texas Gulf Sulphur

POLES APART IN COST AND RESULTS

A spray rig can cover miles of right-of-way speedily and thoroughly.

Hand-cutting crew clearing a right-of-way.

MEN who watch costs have found that chemical weed control and hand-cutting methods are *poles apart* . . . in cost and performance. Dow Weed Killers, used by leading utility companies, have saved *25 to 50 per cent* over hand-cutting or other mechanical methods.

The Dow Chemical Company has developed weed, brush and grass killers that save you money in clearance and maintenance of your right-of-ways. Contact your nearest Dow sales office.

ESTERON BRUSH KILLER, a mixture of low volatility esters of 2,4-D and 2,4,5-T, now contains an acid equivalent of two pounds of 2,4-D plus two pounds of 2,4,5-T per gallon. This product controls woody and herbaceous plants including alder, ash, birch, brambles, cherry, elm, hickory, maple, oaks, osage orange, poison ivy, sumac, willow, and many other species. Assures satisfactory control of most troublesome species on the average right-of-way. Also effective for treating stubs and stumps to prevent resprouting.

ESTERON 245, a low volatility ester of 2,4,5-T with four pounds of 2,4,5-T acid equivalent per gallon. This product controls woody plants in the same manner as Esteron Brush Killer. It is particularly effective on 2,4-D resistant species such as brambles, hawthorn, mesquite, osage orange, palmetto and poison ivy. Also very effective for stump treatment and dormant bark application.

DOW SODIUM TCA 90% controls annual grasses and established perennial grasses including Johnson, quack and Bermuda. Does not present a fire hazard, neither is it poisonous to livestock grazing on treated foliage. Mixes readily with 2,4-D for weed as well as grass control in the same application. Stores well and is easy to handle. At low dosages, it can be used to retard growth without killing, where a light grass cover is desired.

DOW WEED KILLERS

Agricultural Chemical Division

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Atlanta • Cleveland • Detroit • Chicago
St. Louis • Houston • San Francisco • Los Angeles • Seattle
Dow Chemical of Canada, Limited, Toronto, Canada

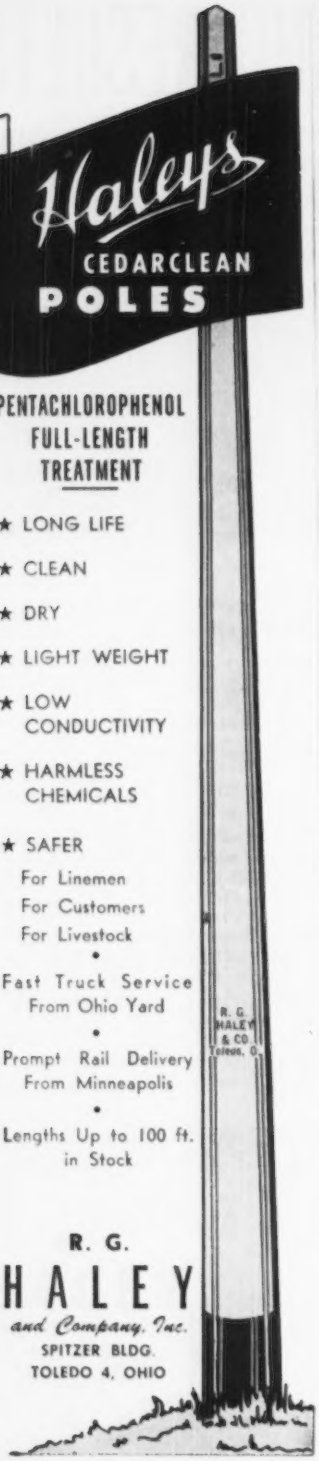
USE DEPENDABLE DOW AGRICULTURAL CHEMICAL PRODUCTS

WEED AND GRASS KILLERS • INSECTICIDES • FUNGICIDES
SEED PROTECTANT • PLANT GROWTH REGULATORS
GRAIN AND SOIL FUMIGANTS • WOOD PRESERVATIVE

DOW

CHEMICALS

INDISPENSABLE TO INDUSTRY AND AGRICULTURE



PENTACHLOROPHENOL
FULL-LENGTH
TREATMENT

★ LONG LIFE

★ CLEAN

★ DRY

★ LIGHT WEIGHT

★ LOW CONDUCTIVITY

★ HARMLESS CHEMICALS

★ SAFER

For Linemen
For Customers
For Livestock

•

Fast Truck Service
From Ohio Yard

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Prompt Rail Delivery
From Minneapolis

•

Lengths Up to 100 ft.
in Stock

R. G.
HALEY
and Company, Inc.
SPITZER BLDG.
TOLEDO 4, OHIO

Co., 2nd Natl. Bank Bldg., Houston, main sulphur mining plant, **$2,500,000**; power plant, **$1,000,000**; pumping units and power generating unit **$1,000,000**; sys. of pipe lines to carry superheated water to wells and convey molten sulphur to pits, **$500,000**.

Tex., Lubbock—City, voted bonds, street lighting exten., imprvs., **$188,000**; 11,000 kw. electric generator power unit, **$1,208,000**. G. S. Harris, city engr.

Washington—Lewis County Public Utility Dist. Chehalis, 80 ft. high dam and hydro-electric plant at Packwood Lake, **$7,000,000**. W. S. McCrea, Jr., Perkins Bldg., Tacoma, consult. engr.

Wyoming—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping point or f.o.b. cars Sinclair, circuit breaker, disconnecting switches grounding blades for Seminole Power Plant addns., Kendrick Proj., Spec. DS-3209. L. N. McClellan, ch. engr.

Low Bidders & Contracts Awarded

Calif., Los Angeles—City Dpt. Water & Power, 207 S. Broadway, 20,000 kv electrical distr. station for Panarama City. Owner builds. **$400,000**. S. B. Morris, ch. engr.

Georgia and South Carolina—U.S. Eng., Post Office Bldg., Savannah, Ga., Oct. 5, constr., Clark Hill Powerhouse and appurtenant works, Clark Hill Proj., Savannah River Basin, Savannah River Serial No. CIVENG-09-133-51-2, from J. W. Bateson Co. Inc., Irwin-Keasler Bldg., Dallas Tex., and Stolte Inc., 8451 San Leandro St., Oakland, Calif., **$7,079,790**.

Iowa—Osceola Electric Co-operative, Sibley rural distr. lines to Stewart, Inc., Anamosa, **$101,871**. Bids 9/26. Scott Eng. Co., Watertown, S. C., engr.

Mich., Holland—City, City Hall, power plant addn., to David L. Green Constr. Co., Fairview St., Muskegon, **$1,250,000**. Awarded 9/27.

Minn., Minneapolis—Western Electric Co., 3120 E. 28 St., general contract 1 story, 151x225 ft., steel, masonry garage and warehouse addn. at site, to C. F. Haglin & Sons, 123 Bryant St. N., **$254,500**. J. F. Ruth, c/o owner, archt.

Tex., Dallas—Dallas Power & Co., Dallas Power & Light Bldg., addnl. transformer unit in Western Oak, California, purchase and hire. Approx. **$75,000**; 13 mi. high-voltage transmission line in "A" oper. force account. Approx. **$673,000**.

Tex., Laredo—Central Power & Light Co., Chaparral St., Corpus Christi, Oct. 3, electric auxiliary power unit, from A & H Incorporated, 7409 Agnes St., Corpus Christi, **$123,200**.

INDUSTRIAL, COMMERCIAL & PUBLIC BUILDINGS

Proposed Construction

Ill., Chicago—Ford Motor Co., 7460 S. Cicero St., Zone 29, rehabilitate former Dodge Chicago Aviation Engine War Plant, incl. 8,000,000 sq. ft. **$60,000,000**.

Miss., Jackson—State Bldg. Comm., New Capitol Bldg., plans by R. W. Naef, Masonic Bldg., E. L. Malvaney Millsaps Bldg., and N. W. Overstreet & Assoc., 201 Lamar St., medical and teaching hospital, **$9,000,000**.

O., Urbana—Liquid Carbonic Corp., 3100 S. Kedzie St., Chicago, Ill., factory, mfg. dry ice and other carbon dioxide items on 14-acre tract near here, **$1,000,000**.

Okla., Tulsa—Bd. Educ. Tulsa, voted, school expansion, **$4,800,000**.

Wash., Everett—Everett Pulp & Paper Co., Everett, 300x350 ft. paper-making plant, **$2,000,000** (with equipment).

Low Bidders & Contracts Awarded

Conn., New Haven—Security Insurance Co., 175 Whitney Ave., 3 story (ultimately 7 story) penthouse, brick, steel, concrete office, Whitney Ave., to W. J. Megin, Inc., 51 Elm St., Naugatuck. Approx. **$2,000,000**.

Ky., Louisville—Louisville Municipal Housing Comm., York St., Zone 2, Oct. 3, South Housing Proj. Ky 1-5, from George H. Rommel Co., 958 Logan St., Zone 3, **$6,816,000**.

A touch of zero in the farmer's kitchen

STRAWBERRIES in December! That's just one small pleasure for the farmer who owns a frozen food unit. More important, it preserves fresh meat and farm-grown vegetables and reduces costly marketing trips for food. Refrigeration for the farm . . . gift of electricity!

With the increasing demand for rural electrification, comes the need for efficient pole-line insulation. Hemingray Power Insulators provide the highly efficient and dependable insulation necessary for medium voltage lines.

No. 670 for 12,000-volt lines. The Technical Standards Committee of the Rural Electrification Administration has approved Hemingray Insulators No. 670, No. 680 and No. 514, under the limits of AIEE Specification No. 41-1944 for use on REA lines.

HEMINGRAY
POWER INSULATORS

American Structural Products Company
Muncie, Indiana
Subsidiary of Owens-Illinois Glass Company

ELECTRICAL INSULATION IS OUR SPECIALTY

Q. *What ONE wire and cable producer grows its own natural rubber, and makes its own synthetic rubber?*

A. UNITED STATES RUBBER COMPANY.

Q. *What ONE wire and cable producer makes plastics?*

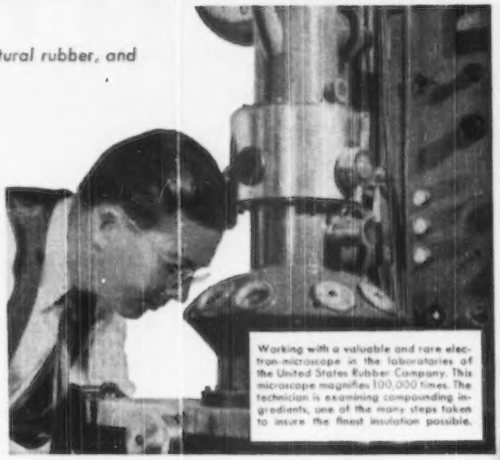
A. "U. S."

Q. *What is the most important part of wire and cable?*

A. The insulation.

Q. *Who is best equipped to make wire and cable with superior insulation?*

A. U. S. RUBBER — which grows its own natural rubber, makes its own synthetic rubber, manufactures its own plastics.



Working with a valuable and rare electron-microscope in the laboratories of the United States Rubber Company. This microscope magnifies 100,000 times. The technician is examining compounding ingredients, one of the many steps taken to insure the finest insulation possible.

Isn't it logical that a rubber company should make the best wire and cable insulation there is? U. S. Rubber has been a pioneer in insulation for over 70 years—has amassed in that time a stockpile of research data and experience that can't be beat. Electrical insulation is a "U. S." specialty!

Electrical insulation makes the difference between superior and ordinary wire and cable. Conductors of all manufacturers are standard, but insulation must be the best that science can produce. That's why your best bet in wire and cable is U. S. Rubber.

SOME MORE OF THE MANY DIFFERENT VARIETIES OF "U. S." WIRE AND CABLE

UTILITIES: Power Cables • Street Lighting • Royal Cords • Network Cables • Utility Control • Pole & Bracket Cable • Service Entrance • Weatherproof • Zip Cord Pole Fixture Cable • Sup. Control

RAILROADS: Power Cables • Communications • Railway Signal • Royal Cords • Welding Cable • Railway Utility • Sup. Control • Weatherproof

HEAVY INDUSTRY: Power Cable • Royal Cords • Welding Cables • Control Cables • Machine Tool Wire • Building Wire • Switchboard Wire • Thermostat Cable • Bus Drop Cable

NOT ONE FAILURE IN OVER 18 YEARS

LAYTEX-NEOPRENE SUPERVISORY CONTROL CABLES

There has never been a reported failure of Laytex-insulated control cable in its 18 years of manufacture. The insulation resistance of these cables actually improves in wet locations! The small diameter of Laytex makes unnecessary the enlargement of cable ducts where signal service is expanding. The Neoprene jacket provides exceptional resistance to abrasion and other abuse, and is highly resistant to the action of oil, flame, and sunlight. The cables are light in weight, easy to install.

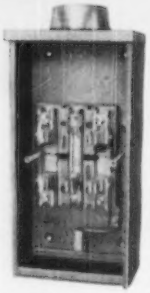
U.S.RUBBER
SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY

ELECTRICAL WIRE & CABLE DEPT. • ROCKEFELLER CENTER, NEW YORK 20, N.Y.

ANCHOR
HIGH CAPACITY
METER
SOCKETS

Designed and built to carry 200 amperes continuous load. Furnished with or without fully automatic circuit closers for by-passing meter. Silver-plated, specially designed jaws are highly resistant to any distortion.



All connectors suitable for #2 to #4/0 cable. Insulated plungers, operated by inserting meter, open by-pass. Heavy springs close by-pass completely before meter is fully removed from socket. By-pass will carry fully rated load. Write for Bulletin 4A.

ANCHOR
MANUFACTURING COMPANY
Factory — Manchester, N. H.
Sales Office: 30 Huntington Ave., Boston 16, Mass.

SCREWS

Machine, Wood, Cap, Lag, Set, Knurled and Thumb Screws

Brass, Bronzes, Aluminum, Monel, Stainless Steels

Large stocks ready for immediate delivery from distributors and warehouses in principal cities.

FREE STOCK LIST

The H. M. Harper Company
8205 Lehigh Ave.
Morton Grove, Ill.

Please rush your current stock list of non-ferrous and stainless steel fastenings showing quantities, sizes and types available for immediate shipment.

Name.....
Company.....
Address.....
City.....Zone.....State.....

Pressure Combustion

(Continued from page 99)

kw unit now installed, and the proposed 6,000-kw unit to be installed early in 1951. Since the building was designed and built to house the second unit, actual cost for the complete 12,000-kw plant is estimated to be $145 per kw.

When the second unit is installed all boilers, turbines, and auxiliaries will be housed in a space of 122,000 cu ft, or 20.3 cu ft per kw. Compactness of the boilers helped materially to keep the size of the building small in proportion to capacity.

Speedy Construction. . . Complete construction of the plant from the time that orders were placed until the unit went on the line required just ten months; actual construction period was seven and one half months. Purchase of a standard turbogenerator, and the boilers which were complete and intact ready for shipping, speeded construction considerably.

Favorable weather (only eight working days were lost because of rain) also played a big part in completing the job in plenty of time to carry the winter peak load of the Santa Fe area.

Appliance Market

(Continued from page 106)

Coin-Meter Washers . . . One interesting fact developed by the survey concerned laundry equipment. About 30% of all buildings of more than 20 apartments provide building-owned or coin-meter washing machines for tenants. A smaller proportion provide clothes drying equipment too. These machines are installed on the basis of about one for every 10 tenants. The electrical consumption of such machines is very much higher than for the individually-owned machine.

The effect of the tendency to provide more kinds of building-owned equipment in larger buildings is to offset, to a considerable degree, deficiencies in tenant ownership of major equipment. As a result differences in consumption on a dwelling unit basis become a question of the size of dwelling unit rather than a question of the basic lack of equipment. Particularly in the elevator-type

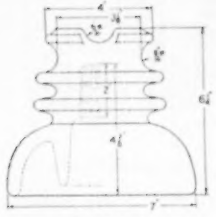
(Continued from page 168)

NEW FROM VICTOR

No. 26

PINTYPE INSULATOR

SOLVES 2 DISTRIBUTION PROBLEMS



NO. 26 DATA

Nominal voltage rating	27 KV.
60 cycle dry flashover	95 KV.
60 cycle wet flashover	60 KV.
Negative impulse flashover	190 KV.
Positive impulse flashover	150 KV.
Dry arcing distance	7⅝ In.
Leakage distance	15 In.
Pinhole diameter	1⅜ In.
Recommended pin height	7 In.
Cantilever strength	3,000 Lbs.
RNI (plain)	8,000 MV.
RNI (radio-freed)	100 MV.
1000 KC at applied	15 KV.

1. **STEPPED-UP VOLTAGES**—Victor's No. 26 is designed to be used in *raising* insulation levels on present lines, or *providing* for future voltage increases on proposed low voltage lines. It has a rated 60 cycle dry flashover of 95 KV. and a wet flashover of 60 KV., with a nominal voltage rating of 27 KV. So, by installing these new pintypes now, you can keep replacement costs at a minimum when line-loads are increased.

2. **CONTAMINATED AREAS**—Victor's No. 26 insulator lowers maintenance costs in fog and contaminated regions because of its *self-cleaning design* and *long leakage distance.* This means fewer replacements as well as less maintenance.

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buildings the larger amount of building use of electric service more than offsets the smaller use in one, two or three room apartments, so that the average total consumption per dwelling unit in the building exceeds that of the average residential customer.

Street Lighting

(*Continued from page* 110)

has existed up to the present time. Few series circuits are being converted to multiple with the exception of business areas where secondary networks are readily available. This, of course, is recognized as a clear cut case for multiple distribution.

Indicative of these facts are the following figures. In conducting the survey it was found that, following the old general pattern, multiple lamps were outnumbered about 9 to 1. However, the manufacturers see a trend toward multiple operation based on sales figures since the war. Street lighting equipment sales show only about 65% of the material purchased is for series operation; the remaining 35% for multiple operation.

Therefore, the long-range viewpoint of this condition is with higher level of illumination, increased intensities, new lighting planned for expanded residential areas, and lower multiple control costs; these will gradually shift the old relationship of 90 and 10 to something more like 75 and 25.

A comparison* of capital costs and operating charges for both multiple and series system will appear in an ensuing issue.

* Based upon an analysis prepared by C. J. Lake, Central Station Divisions, General Electric Co.

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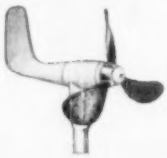

THE AEROVANE® TRANSMITTER—Combines wind speed and direction components in one unit. It consists of a three-bladed molded rotor to measure wind speed, and a streamlined vane for wind direction.

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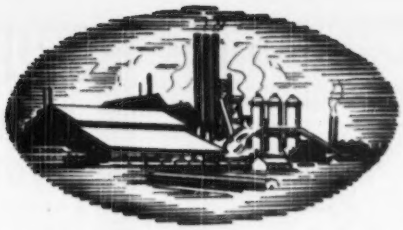

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It's no stretch of the imagination, rather, robust realism to call our past half century a Miracle—U. S. A.

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And here's another phase of the miracle that went hand-in-hand with these and the myriad of intertwined technological advances—ranging from the radio telephone and Bakelite to the X-ray tube and teletype . . . and to atomic energy and its untold potentialities.

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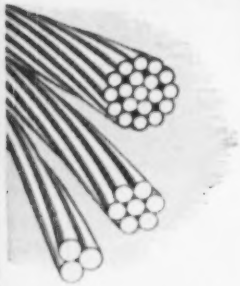
CONDUCTORS



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TECHNICAL LITERATURE

Load Frequency Control—*Impulse Type Load-Frequency Control for Interconnected Power Systems*, 23 pp, has been written in the form of a textbook by S. B. Morehouse of the L&N engineering staff. There is information on the following topics: Application of automatic control to a governor, possible types of manual regulation on a system, automatic controls for an interconnected system, proportionate load control at the station, base load control, results secured with automatic control, and additional information on telemetering arrangement of system operator's office, and communication. Many pictures and diagrams illustrate the text. This booklet may be secured from the Advertising Division, Leeds & Northrup Co, 4901 Stenton Ave, Philadelphia 44, Pa.

Cedar Poles—*Handbook of Practical Information about Cedar Poles, Their Preservation, and Handling* includes the latest revisions of American Standard Specifications for western red cedar and northern white cedar poles. There are sections on marking, measurement of sweep and short crook in poles, painting or staining, storage of poles, types of carloads of poles, instructions for unloading, counting and handling (including use of pikes and cant hooks), and weights. The handbook has been prepared by Page & Hill, Inc, Minneapolis, Minn.

Inspected Equipment—*List of Inspected Electrical Equipment* contains summaries of Listing Card Reports on electrical equipment which has been examined with reference to fire and accident hazards and for conformity with the provisions of the National Electrical Code applying to its installation and use. Attention is called to the current and voltage limits and classifications, markings, and special descriptions and other limitations applying to the several items. This 496-page book includes all listings up to May 1, 1950. It is available from Underwriters' Laboratories, Inc, 161 Sixth Ave, New York 13, N. Y.

Radio Noise Meter—*Proposed American Standard Specifications for a Radio Noise Meter, 0.015 to 25 Megacycles per Second*, has just been published for a year's trial. It contains specifications for an instrument intended for general use in factories and in the field. The proposed specifications, C63.2, may be obtained for 65¢ from American Standards Assoc, 70 E. 45th St, New York 17, N. Y.

Soil Corrosion—Results of measurements of the corrosion of copper, lead, and zinc after exposure to different soil conditions for a maximum of 14 years appear in Publication RP2077, *Soil-Corrosion Studies, 1948 and 1918: Copper Alloys, Lead, and Zinc*. Magnitude and progress of corrosion with respect to weight loss and pitting are interpreted in relation to the composition of the materials and the properties of the soils at the test sites. The 31 page report may be had for 20¢ from the Supt of Documents, U. S. Government Printing Office, Washington 25, D. C.

Meter Sockets—Standards contained in *AEIC-EEI-NEMA Standards for Watthour Meter Sockets* are intended to encompass the salient features of die-cast, stamped, ring and box or trough-type watthour meter sockets. The sockets are those for use with standard detachable-type watthour meters, demand meters, time switches, instruments, or combinations thereof. Publication 164-1950 is priced at $1.25 from National Electrical Manufacturers Assoc, 155 E. 44th St, New York 17, N. Y.

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CATALOGS • BULLETINS

● POLE HARDWARE: A 40-page catalog covers the company's entire line of drop forged high-line hardware. It contains pictures, blueprints, and specifications for all standardized equipment for both transmission and distribution construction. Brewer-Titchener Corp, Cortland, N. Y.

● OVERHEAD CRANE: Illustrated Booklet G-709 shows a wide range of installations of overhead electric traveling cranes in power plants, steel mills, electrical shops, railroad yards, etc. Northern Engineering Works, 2615 Atwater St, Detroit 7, Mich.

● SOLDERING: A fully illustrated catalog covers the complete line of soldering guns, including those with prefocused spotlights to eliminate shadows. Weller Electric Corp, Easton, Pa.

● POWER CABLE: "Super Corenol-Geoprene Power Cable for Circuits up to and including 15,000 Volts" is Publication 19-150. The booklet contains charts and tables on physical and electrical properties, splicing and terminating instructions, specification data, and application recommendations. The cable can be buried directly in the ground or in aerial or raceway installations. Construction Materials Dept, General Electric Co, Bridgeport 2, Conn.

● STEAM GENERATORS: Miniature electric steam generators in sizes from ¼ to 1½ hp are covered in available literature. They can be used in rubber, plastics, food, garment, and fur industries, and in laboratories. Automatic Steam Products Corp, 140 W. 31 St, New York 1, N. Y.

● TECHNICAL SERVICES: Scope of services available is explained in "All Under One Roof." It touches on research, process development, production methods, evaluations, expert testimony, investigations, testing and analysis. Sam Tour & Co, Inc, 44 Trinity Place, New York 6, N. Y.

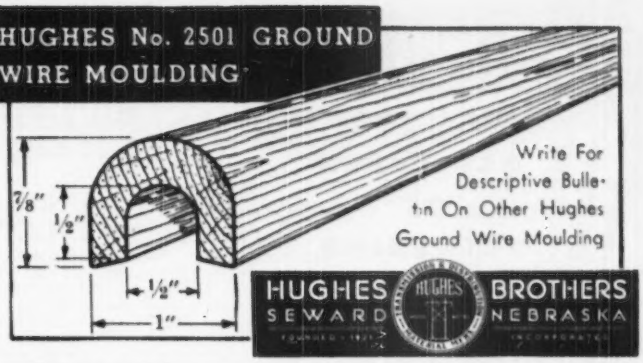
● VARIABLE TRANSFORMERS: Bulletin P570 describes in detail both manually operated and motor-driven Powerstat variable transformers and line correctors. A rating chart offers a quick selector index. Superior Electric Co, Bristol, Conn.

● BREAKDOWN TESTERS: Thirteen models of Hypot high-potential insulation breakdown testers are covered in Bulletin 5A. Capacities range from 300 va to 5 kva, with test voltages from 3,000 to 30,000 v ac. Associated Research, Inc, 3760 W. Belmont Ave, Chicago 18, Ill.

● VALVE TRIMMING: Photographs of installations and advantages of Monel-trimmed steam valves and parts appear in "Trimming Valve Costs with Lasting Trim." The International Nickel Co, Inc, 67 Wall St, New York 5, N. Y.

● LIQUID LEVEL INDICATORS: Bulletin WG-1823 describes liquid level indicators and auxiliary attachments for remote indication of liquid level in boilers, feedwater heaters, storage tanks, etc. Construction and operation details, in-

HUGHES No. 2501 GROUND WIRE MOULDING



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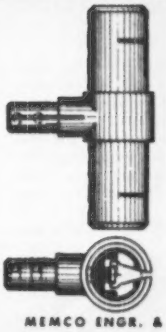

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installation suggestions, dimensions, ordering information are all included. Yarnall-Waring Co, Mermaid Lane, Philadelphia 18, Pa.

● HYDRAULIC COUPLING: The complete line of twin disk hydraulic couplings from 7.4 to 27 in., for motors and engines in the range from 3/4 to 700 hp, appear in Bulletin 144-B. Twin Disc Clutch Co, Racine, Wis.

● GENERATOR PLANTS: The entire line of the company's products available to the export market are described in a 12-page folder. These include gasoline and diesel powered generating plants and accessories. There is a list of suggestions for negotiating export documents. D. W. Onan & Sons, Inc, Minneapolis 14, Minn.

● FHP MOTORS: Fifteen features of the VA series of variable speed fractional horsepower motors are exhibited in 4-page Bulletin 1001. The line has 10:1 speed ratios over a range from 4 to 10,000 rpm. U. S. Electrical Motors, Inc, 200 E. Slauson Ave, Los Angeles 54, Cal.

● COUPLINGS: Characteristics, application, operating efficiency, construction details, and control of Dynamic water-cooled couplings appear in a bulletin, "Water-cooled Couplings for Adjustable-Speed Drives from AC". Dynamatic Corp, Kenosha, Wis.

● SWITCHES, POTHEADS, CABLE: "G&W Forethoughts" cover the following topics: Type CS conduit cable seal, No. E3-2, Type GRAM oil switches installed on network transformers for primary feeder disconnecting, grounding, and selection, No. D2-7; stress relief cones of high voltage cable terminations, No. A2-8; and Type TA Shape A 3-conductor pole-top pothead, No. A3-9. G & W Electric Specialty Co, 7780 Dante Ave, Chicago 19, Ill.

● CONDUCTOR ARMOR: Cold line and hot line installation of preformed armor rods, and advantages to be gained, are covered in 4-page Bulletin 10-200, "Conductor Reinforcement Armor". Mr. Kenneth Miller, Preformed Lined Products Co, 1051 Power Ave, Cleveland 14, Ohio.

● DRY-TYPE TRANSFORMERS: The company's complete line of dry type transformers from 0.1 to 2,000 kva are described and illustrated in Bulletin 326. Included are open coil and completely enclosed types, unit substations, and core and coil units. R. E. Uptegraff Mfg Co, Scottdale, Pa.

● CANVAS EQUIPMENT: Catalog No. 6 covers canvas equipment for linemen and line trucks. Included are belt and gloves bags, tool buckets, line hose bags, tool blanket, gauntlet work gloves, Class 0 rubber gloves, etc. The Warren Heim Corp, 15 River St, New Rochelle, N. Y.

● SCHOOL LIGHTING: There are over 175 illustrations with accompanying data and practical recommendations in "Lighting Educational Institutions". Classrooms, chapels, libraries, down the line to laboratories are covered, showing lighting layouts and illumination-level data. There are 34 specific plans for different types of space that occur repeatedly in most large educational buildings. Holophane Co, Inc, 342 Madison Ave, New York 17, N. Y.

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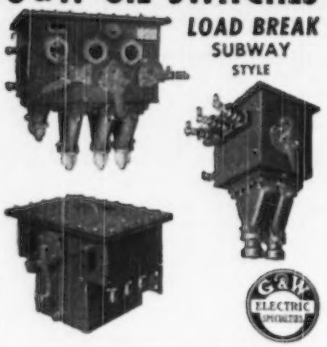

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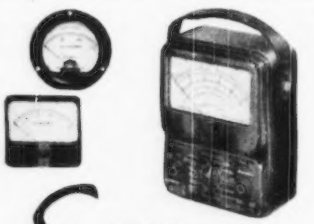

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BOOK REVIEWS

Economics and Public Utilities by Eli Winston Clemens. Published by Appleton-Century-Crofts, Inc. 35 West 32nd St. New York 1, N. Y. 765 pages, illustrated. Price $5.75

Professor Clemens has attempted to bring together a complete treatise on the subject of public utilities from the point of view of economics, accounting, law, public administration, and government control. We think that the subject is well covered and that it fills an important current need for an up-to-date publication. Except for a few excursions, the treatment of the various problems of depreciation, rate of return, and governmental activities is impartial. However, since the basic function of this material is used for college courses, it is important to note certain questionable statements. The quotes are taken at random: "Lord Keynes, one of the greatest of modern economists, . . ." "From a social standpoint much can be said for the 'unsound' financial practices that continuously returned corporate earnings to the national income stream through dividends to the stockholder. . . ."; "The inclusion within the allowable return of a certain amount, in excess of dividend requirements, to be credited to surplus is of doubtful propriety." "Historically, the TVA must be regarded as a new and emerging institution—a logical development of the failure of the privately owned utility industry to meet all the needs of the time."

In all fairness it must be added that the majority of conclusions of the author are quite sound from many points of view.

Das Trockengleichrichter Vielfachmessgeraet. By T. Walcher. Published by Springer-Verlag, Vienna. 144 pages, illustrated. Paper $3.20.

A summary of the applications of dry-type rectifiers in measurements of wide diversity in field of current and voltage, resistance, capacitance, frequency and inductance.

Elektrische Niederspannungs-schaltgeraete. By W. Kussy. Published by Technischer Verlag Herbert Cram, Berlin W 35. 353 pages, illustrated. Price 38 DM.

A discussion of the functional principles and quantitative design of low-voltage switching apparatus (starters, controllers, regulators, magnetic devices) and their components and accessories.

Procedure Handbook of Arc Welding Design and Practice. 9th Edition. Published by Lincoln Electric Co, Cleveland 1, Ohio. 1200 pages, illustrated. Price $2 in U. S., $2.50 elsewhere.

Material in this new edition has been completely reorganized and revised to bring it up to date in coverage of recent developments in the art. New design data and latest procedures in welding have been added. Added also is a new chapter on weldability containing information resulting from recent metallurgical research. The section on structural design has been enlarged to include more information on welded rigid framing as has also the section on machine design.

Ionization Chambers and Counters. By D. H. Wilkinson. Published by Cambridge University Press, New York 10. 266 pages, illustrated. Price $4.50.

A review of the various electrical counting methods which are being brought into prominence by nucleonic radiation. These are the ionization chamber, the proportional counter, the Geiger-Mueller counter, crystal counter, spark counter, scintillation counter, etc.

GET THE BEST IN OUTDOOR BUS SUPPORTS—*Specify 3E!*

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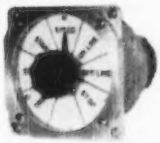

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Of Electrical World published Weekly at Albany, New York, for October 1, 1950.

1. The name and address of the publisher, editor, and managing editor is: Publisher, McGraw-Hill Publishing Company, Inc., 330 West 42nd St., New York 18, N. Y. Editor, Fischer Black, 330 West 42nd St., New York 18, N. Y.; Managing editor, Daniel T. Brarmer, 330 West 42nd St., New York 18, N. Y.; Business manager, None.

2. The owner is: McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York 18, N. Y.; Stockholders holding 1% or more of stock: Curtis W. McGraw, Executor of the Will of James H. McGraw, 330 West 42nd Street, New York 18, N. Y.; James H. McGraw, Jr., Curtis W. McGraw and Donald C. McGraw, Trustees for Harold W. McGraw, James H. McGraw, Jr., Donald C. McGraw, Curtis W. McGraw, all of 330 West 42nd Street, New York 18, N. Y.; James H. McGraw, Jr., and Curtis W. McGraw, Trustees for Catherine Osmun, 330 West 42nd Street, New York 18, N. Y., Edwin S. Wilsey and Curtis W. McGraw, Trustees for James H. McGraw, 3rd, Madison, New Jersey; James H. McGraw, Jr. 330 West 42nd Street, New York 18, N. Y.; Curtis W. McGraw, 330 West 42nd Street, New York 18, N. Y.; Donald C. McGraw 330 West 42nd Street, New York 18, N. Y.; Mildred W. McGraw, Madison, New Jersey; Grace W. McIlvon, 536 Arenas St., LaJolla, Calif.

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5. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was: 22,022.

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2— 150 KW G.E. 125/250 V 1200 RPM 4150 Volt
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2—4500 KVA G.E. 3 Ph. 27,000V, 2300V.
1—1500 KVA G.E. 3 Ph. 4150 V 2300 Pyranol
1—1000 KVA G.E. 3 Ph. 4150 V 2400 V
1—1000 G.E. 3 Ph. 4150 2 Ph. 2400 V
1— 500 KVA Kuhlman 1 Ph. 4150 V. 2300 V
3— 400 KVA G.E. 6900 2300 V Sec.
3— 100 KVA G.E. 4150-240/480 V Pyranol
3— 75 KVA G.E. 2400-240/480 V
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LETTERS TO THE EDITOR

How Big is BIG

To the Editor:

I notice in your issue of October 2, 1950, under the heading "How Big Is BIG?", several classifications reflecting the relative size of a number of electric companies operating in the United States. . . Being somewhat proud of the size of our company, I wondered why we fell to second and third place, respectively, in the "Electric Plant Investment" and "Total Kilowatt Sales" blocks.

Consolidated Edison System is an integrated system operating in New York City and adjoining Westchester County and its entire generating capacity is operated for the joint benefit of itself and its electric subsidiaries. If the information shown in the several statistical blocks in the article was made comparable with that in the block showing the number of customers, the following figures for 1949, or as of December 31, 1949, should have been used:

	Con Ed Data	Electrical World Data
Plant Investment (as reported to SEC)	$1,021,938,101	$831,396,823
Operating Revenue	253,363,106	239,647,354
Operating Income	35,233,913	34,118,940
Total Sales (1,000 Kwhr)	10,116,112	9,514,446
Steam Capacity (Kw) (also Total)	2,797,700	2,737,700
Steam Generation (1,000 Kwhr) (also Total)	11,085,781	11,085,781

With the figures on a consistent basis, Consolidated Edison would be in first place in each of the blocks, except "Total Kilowatt Hour Sales," and if there were included Staten Island Edison Corporation, which is now part of our system, the company would be No. 1 in all blocks listing its name.

Charles Nodder
Assistant to Chairman
Consolidated Edison Co of N. Y., Inc.
New York 3, N. Y.

(Editor's Note: The explanation is simple. As stated in our introduction, the list of customers was taken from the "McGraw Central Station Directory 1950"; the other listings are as given by FPC.)

To the Editor:

I note with interest and surprise, in ELECTRICAL WORLD, October 2, 1950, the compilation of the largest companies in this country. In the past, similar computations have been made reporting the Niagara Hudson Power Corp a holding company, and, with this method of reporting, Niagara Hudson had a few "firsts".

	Rating	NMPrCorp As reported by Electrical World	NMPrCorp Consolidated*	Rating
Customers	8	857,176	291,644	7
Plant Investment	5	$443,030,737	$509,988,083	5
Operating Revenue	7	$109,654,625	$122,934,350	6
Operating Income	5	$23,193,502	$26,200,155	4
Total Sales (1000 kwhr)	4	7,669,091	11,247,979	1
Capacity (Kw) Hydro	3	446,634	961,101	2
Steam	6	977,350	977,350	6
Total	5	1,423,984	1,938,451	2
Generation (1000 kwhr) Hydro	7	2,818,905	6,324,499	1
Steam	6	4,746,543	4,746,543	6
Total	6	6,765,449	11,271,042	1

* Niagara Mohawk Power Corp including subsidiaries —Niagara Falls Power Co, Canadian Niagara Power Co, St. Lawrence Power Co Ltd, Oswego Canal Co.

You are now reporting the Niagara Mohawk Power Corp an operating company, but only on a corporate basis without subsidiaries. If you report Niagara Mohawk Power Corp an operating company on a consolidated basis, which is comparable with previous reportings of Niagara Hudson, you will note that Niagara Mohawk Power now has three "firsts" and two "seconds" (see accompanying table).

J. J. Albright, Jr
General Superintendent
Power Control
Niagara Mohawk Power Corp
Syracuse, N. Y.

(Editors Note: As explained in the footnote in Table I of our centerspread of Oct 2, 1950 the Niagara Mohawk figures included only those of the three American firms which were merged to form Niagara Mohawk. All Canadian statistics were ignored. Niagara Falls Power Co was listed separately as can be seen in several of the tables. There is no doubt that Niagara Mohawk is one of the nation's "tops" in many respects. This will become more evident in our 1951 listing after Niagara Falls Power Co will have been merged into the parent firm.)

Wage or Wage Increase

To the Editor:

On page 83, ELECTRICAL WORLD, September 25, 1950, it is stated that the Scranton Electric Co has signed a contract with Local 265, providing for a wage of 6.1¢ per hour retroactive to July 1. The agreement granting an improved pension plan must be a honey to keep the boys satisfied with 6.1¢ per hour! No foolin', that is about the wage I got when I started in the electrical business.

E. A. Roberts
Carlsbad, N. M.

(Editor's Note: This either proves that Scranton Electric has some smart labor negotiators or that we may have meant an increase of 6.1¢ an hour. Take your choice.)

Engineers Is Classified

To the Editor:

We usta b'lieve 'n the' worth o'
th' individual, and' the'
sacredness of th' human soul.
But, now—there ain't no
incentive; 'cause there
ain't no goal.

When engineers is classified, an'
regimented, an' put 'n a
slot,
An' ain't no reward f' merit, er
no mental pay,—the'
perfession sure ain't so hot!
So, son, don't be ambitious, an'
waste yer time er effort—
it's done been tried.
You'll just be another chump,
Engineers is Classified!

Maggie Craig
Beaumont, Texas

(Editor's Note:
To the prosy argument
she give a diff'rent slant.
And we are glad to print her lines,
for who will say she can't
Inspire the wives of engineers
To something more than shedding tears
while husbands rave and rant.)

Three R's of Safety

To the Editor:

The article "The Three R's of Electric Utility Safety" appearing in the October 9th issue of ELECTRICAL WORLD is the best of its kind that we have ever seen and we would like to know whether reprints of this article will be available.

P. W. Raymer
Operating Manager
Montreal Engineering Co, Ltd
Montreal 1, Canada

(Editor's Note: Thank you Mr. Raymer. Reprints are available and as of this week nearly 10,000 have been ordered.)

INDEX TO ADVERTISERS
See Page 175

Let's Look at the CURRENT PATH

Thruout the entire range, from 400 to 5000 amperes and from 7.5 to 230-kv., the current path of the "MK-40" is designed with a minimum number of current interchange surfaces. High pressure silver-to-copper contacts are used at both ends of the tubular floating blade—the simple and logical way to eliminate flexible shunts. All parts are in plain view for visual inspection.

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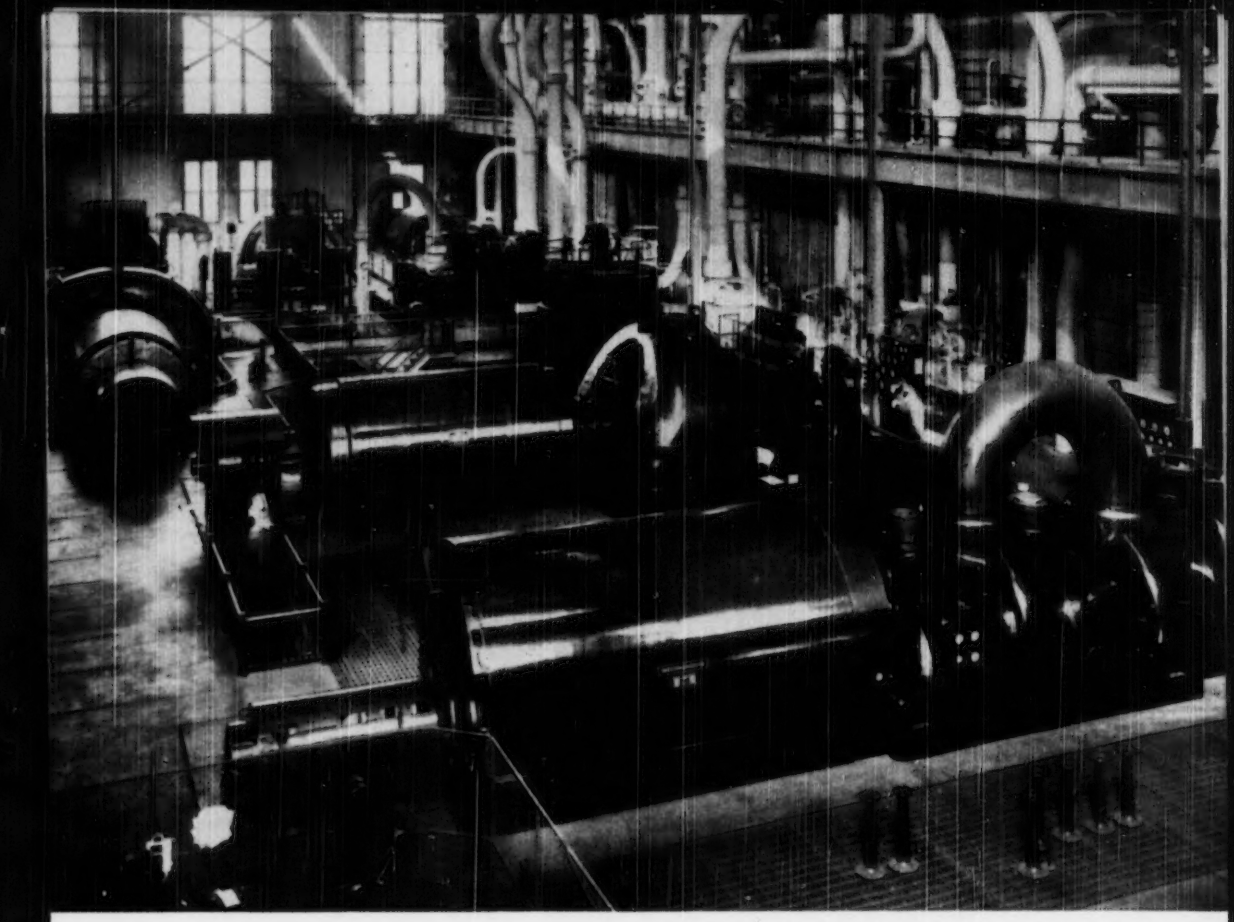

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